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IN THE

Supreme Court of the United States

OCTOBER TERM, 1936

No. 41.

UNITED STATES OF AMERICA,
Petitioner,

vs.

ROBERT ESNAULT-PELTERIE,
Respondent.

BRIEF FOR RESPONDENT

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IN THE

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UNITED STATES OF AMERICA, Petitioner, v. ROBERT ESNAULT-PELTERIE, Respondent.	No. 41.

BRIEF FOR RESPONDENT.

Statement.

The case at bar is a suit for infringement of a patent to Robert Esnault-Pelterie for Improvements in Aeroplanes, No. 1,115,795, dated November 3, 1914. It originated in the Court of Claims on June 20, 1924, and was decided by that court favorably to respondent (on November 4, 1935) as to all of the claims in suit (viz., claims 2 and 5 to 9), holding the latter valid and infringed. The findings of fact and decision of the Court of Claims are before this Honorable Court in the transcript of record.

The petition herein invoked the extraordinary jurisdiction of this Court on account of the fact that the same patent had been held by the Court of Appeals for the Second Circuit, in the case of *Robert Esnault-Pelterie* v. *Chance Vought Corporation* [66 Fed. (2d) 474], to be so limited in scope as not to be infringed by certain conventional airplanes manufactured by the Chance Vought Corporation. So far as we are aware, this is the first suit brought before this Court under circumstances where a patent has either

been held invalid or so restricted in scope as to avoid infringement in a Circuit Court of Appeals and subsequently held to be valid and infringed in the Court of Claims.

To intelligently discuss the issues here involved requires that the Court shall first understand the physical conditions which prevail in the art of flying heavier-than-air airplanes, the nature and character of the invention in suit, and the results attained thereby.

Physical Conditions Attending Flight.

An airplane is enabled to fly by the reaction of the air against the under side of its wings, and requires that the plane shall move forwardly at a rapid speed through the air—either by the action of a fast-revolving propeller, as in normal flight, or by the action of gravity, as when the plane is gliding downward. To maintain the plane in the air, the wings invariably are given a slight angle to the horizontal, the front or leading edges of the wings lying higher than the rear or trailing edges. This is called the "incidence" of the wings, and their angle is called their "angle of incidence."

Every airplane has a tail surface of some sort—this being a horizontal surface of some proportions, which assists in balancing the plane longitudinally.

Every airplane must, of course, be provided with a steering rudder, which is practically identical with the steering rudders of marine vessels—being a plane surface, usually pivoted vertically, at the rear of the airplane, and designed to alter the course of the airplane to the right or to the left. Mechanically speaking, it turns the airplane around a vertical axis in either direction. The specific construction of the steering rudder and its specific operating parts are not of importance in this case. The steering rudder may be operated by the hand of the pilot, or by his feet, or in any other suitable way. Steering is not a vital control in flying so far as the safety of the airplane is concerned.

An airplane is in equilibrium, generally speaking, when all of the forces acting upon it (such as air-reaction, gravity,

centrifugal force, etc.) balance each other on both sides of its longitudinal axis and both sides of its horizontal transverse axis.

To fly at all requires that this balance shall be substantially maintained at all times. This is true, irrespective of whether the plane is flying level, or whether it is banking, turning, looping, diving or executing any other maneuver.

A plane may be temporarily unbalanced if it is very quickly brought back to equilibrium again.

If an airplane merely had to fly through a wholly undisturbed medium, such as perfectly calm air, the problem of flight would have been solved much earlier than it was.

But such perfectly immobile air is never encountered near the earth. Normal air is marked by a very considerable degree of turbulence—even in very light winds, or when the weather appears very calm. It is increased by any substantial wind.

This state of turbulence is produced by air currents, gusts, swirls, eddies, updrafts, and the like, which take place completely at random. Their direction, force and succession are wholly unpredictable by the pilot. They act against the wings, fuselage, tail, etc., of the plane almost always to unbalance it. The air surfaces of a plane, such as the wings, are large, and the leverages at which the air disturbances act are hence great. It is small wonder, therefore, that an airplane is in constant danger of losing its equilibrium. It was this necessity for the preservation of equilibrium which delayed actual flight for many years.

The Wright brothers, fathers of flying, stated in 1908 that the crucial problem of flying had proven to be

> "exactly what we knew it must be—the question of equilibrium" (Rec. p. 58).

To keep an airplane aloft requires a certain flying speed (now from 40 to 80 or more miles per hour). This flying speed is not a mere desirability—it is absolutely essential. A plane cannot take off from the ground without reaching its flying speed, and it cannot land unless it maintains it

up to the time the plane contacts with the ground (or water, in the case of sea-planes).

When a plane falls below its flying speed in the air, it does not slowly and safely glide to the ground. On the contrary, the entire phenomenon of flight collapses, and the plane falls precipitately to the ground.

The same is true when a plane loses its equilibrium to an extent that it cannot be restored. The plane becomes quickly out of control; frequently it loses its flying speed, and a crash is almost inevitable.

The turbulence of the air tends to upset or tilt the plane *in any direction.* Worse than this, one gust or swirl is frequently succeeded by another, and another, from different directions, in close succession. Flying is only possible when the pilot can instantly balance or stabilize his plane against them all.

Ever since the inception of the idea of flying, more than sixty years ago, attempts have been made *automatically* to maintain the plane in balance under all conditions; but, even down to the present time, no one has been able successfully to accomplish it. The only successful controls have been manually operated by the pilot.

It, hence, has always been due to the quick thinking and instantaneous muscular reaction of the pilot that heavier-than-air flying has been possible.

An airplane is built to fly normally in a level attitude, and its wings and other surfaces are constructed to maintain this attitude when undisturbed.

By a simple analysis it will be seen that when a plane departs from this level attitude it does so by turning around one or both of its major axes. That is to say, when its nose is moved upward or downward the plane in effect turns or inclines around a horizontal transverse axis, which is usually amidships, although it may be displaced toward either end. This is familiarly called "pitching" or "nosing" up or down.

When the plane is turned sidewise, so that one wing is higher than the other, the turning or inclination is around

a longitudinal axis of the plane—usually its central longitudinal axis. This is familiarly called "rolling" or "banking."

Balancing or Stabilizing Organs.

It was early recognized—even in the theoretical art which preceded actual flight—that if an airplane was to be stabilized, or restored to balance when it departed therefrom, it should be provided with two movable organs, each of which organs is designed to turn or incline the plane around one of the axes just described. Each organ operates by increasing or decreasing its angle of incidence to the line of flight, so as to produce a greater or less aerodynamic effect upon the plane to cause it to incline or turn around its appropriate axis and thereby stabilize it.

The organ which was provided for inclining the plane around its horizontal transverse axis is known as an "elevator," or ascensional rudder or horizonal rudder [hereinafter, for simplicity, called an "elevator"]. It is usually hinged to the fuselage of the plane at the tail thereof, and by moving its free rear edge upwardly it causes the tail to tilt downwardly and the nose upwardly. By depressing the elevator, a reverse action takes place and the plane noses down.

The organ which was provided for inclining the plane around its longitudinal axis was, for convenience, in two parts—one part being situated at each of the tips of the wings. It comprises portions of the wings, which are bodily distorted to increase their incidence or angularity. In some cases the wings are distorted by being bodily warped. In other cases they are distorted by hinging portions of the tips and swinging such hinged portions. Such hinged sections constitute what are known as "ailerons." In either case the wing is distorted from its normal form to increase its lift or decrease it (usually one is increased in angularity and the other decreased). The plane is, hence, caused to roll around its central longitudinal axis, as before described.

The essential feature is that one wing shall be in some way distorted to increase its incidence over the other (or *vice versa*). Since there is no real dispute in this case that distorting the wings by warping is the equivalent of distorting them by ailerons, we shall usually refer to "ailerons" or "aileron action," or similar terms, as a more modern or convenient way of expressing the ideas involved. The patent in suit illustrated the invention as applied to planes whose wings were warped (see Finding XXII).

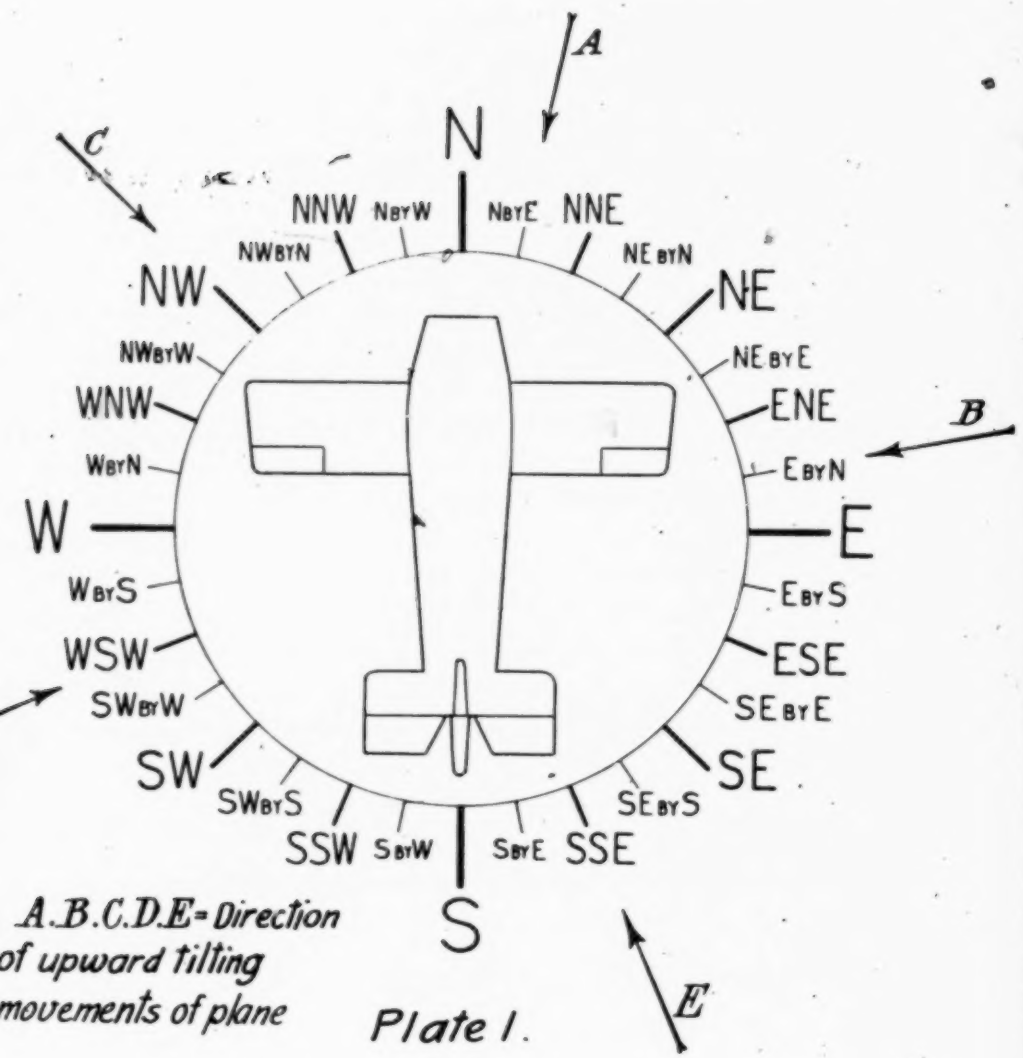
By these two organs (ailerons and elevator) the plane can be made to turn or incline about either axis alone, or about both axes to a greater or less degree, respectively.

If an airplane, therefore, is flying in a level condition and it is hit by a simple gust coming from any point in the compass, so that the plane is tilted or inclined in any direction, it is possible for the two stabilizing organs to be operated to restore it to a balanced condition at a level attitude. In so doing, the proportion of corrective effect that is given by manipulation of the ailerons may range anywhere from zero to 100%, while simultaneously the elevator may be operated to give from 100% effectiveness to zero. Of course, there are occasional disturbances of attitude which require the operation of only the ailerons or the elevator. But a great majority of the disturbances require a compound manipulation of both.

Illustrations of Disturbance in Balance.

We have diagrammatically illustrated conditions of disturbed balance or equilibrium in the cuts shown in plate I on the opposite page. In these cuts are shown the cardinal points of the compass.

In plate I is superimposed a diagrammatic illustration of an airplane headed due north. If an airplane be proceeding in this direction on a level keel in a condition of stability or balance, and a gust or other air disturbance should affect it—with the result that that portion of the airplane which points north-by-east, for example, is elevated or inclined upwardly, as shown by the large arrow marked



A.B.C.D.E= Direction of upward tilting movements of plane

Plate I.

"A"—it will be observed that two things have been done to the plane, viz., its nose has been forced upward by a movement around a horizontal transverse axis of the plane, and its right wing has been elevated, thus turning the plane around its longitudinal axis. The plane is thus unbalanced in two directions.

It will be noted in the illustration given that the nose of the plane has been elevated very considerably more than the plane has been rolled to the left. Hence to correct the tilt, the elevator action must be much greater than the aileron action. If we represent the total action of the two as a 100% corrective force, then in the particular instance given the elevator action will amount to about 87% of the total and the aileron action to about 13%.

These represent *proportions* only. They are not to be confused with the *magnitude* of the total correction. That is to say, the tilt of the plane may be very violent, throwing the head of the plane upward to an extreme angle; or the tilt may be quite moderate. In any event, however, so long as the two tilts are in the *same direction* (for instance, along the arrow A) the *relative proportions* of elevator correction and aileron correction will remain the same.

If the *magnitude* of the tilt is greater, then both elevator and aileron corrections, while remaining proportionate, will both be of an intensity to correspond with the increased magnitude.

Irrespective of the magnitude of the tilt, therefore, the proportions of elevator and aileron correction in the instance given are about 87% to 13%. Since the nose is elevated, the action must be *nose down* elevator, and since the left wing is depressed, the action must be *left-wing* action to stabilize the plane.

If the tilting movement of the airplane, instead of being at north-by-east, as indicated by the arrow "A," should be, for example, at east-by-north, as indicated by the large arrow "B"—then the main disturbance would be an inclination around the longitudinal axis of the plane, and the minor disturbance an inclination around the transverse axis. To

correct this would require approximately 87% of *left*-wing aileron action to roll the plane to the right, and only 13% of elevator action, forcing the nose *downward*.

If the upward tilt should be, let us say, at northwest, as shown by the large arrow "C"—with the result that the plane nosed upward and rolled to the right instead of to the left—then the proper correction is approximately 50% nose-*down* elevator action and approximately 50% *right*-wing aileron action.

If the tilt upward should be at west-southwest, as shown by the arrow "D," then approximately 75% *right*-wing aileron action would be required and approximately 25% nose-*up* elevator action.

If the disturbance were at south-southeast, as shown by the arrow E, then approximately 25% of *right*-wing aileron action would be required and 75% of nose-*up* elevator action.

These are merely illustrations, since the plane may be tilted upward at any point in the 360 degrees of the circle. All such disturbances can be corrected by a proper combination of aileron and elevator action.

In order to do so, however, requires an instantaneous selection of elevator action, either nose-upwardly or nose-downwardly; it also requires an instantaneous selection of aileron action, either right or left; and, finally, it requires such a selection in *all proportions of elevator and aileron action.*

But this is not all.

We have referred only to *simple* disturbances of the airplane, and have assumed a single and isolated gust hitting a level airplane.

In actual practice, however, it frequently happens that gusts succeed one another rapidly, and it also frequently happens that before a correction can be fully accomplished, other gusts hit the plane from different directions. The pilot, therefore, is constantly called upon to correct compound disturbances from one point and then immediately correct similar disturbances from another point or points.

All such unbalancing disturbances place the plane in an unstable condition, and, unless immediately corrected, in great danger.

The conditions were perfect for mental and muscular confusion on the part of the pilot, and flying an airplane was a very hazardous task.

At an appropriate place in this brief, the prior art relied upon by the petitioner will be discussed in detail.

It suffices to say here that prior to the accomplishment of actual flight, as well as after successful flight had been accomplished, many efforts had been made to produce a satisfactory combination of the two control organs and manually operable parts to be actuated by the pilot. There is no contention in this case that a really practical and efficient device had ever been produced prior to the respondent's invention in suit notwithstanding many prior proposals in prior art patents.

The Wright brothers, the pioneers of heavier-than-air flight, provided a notoriously inadequate equilibrium control system—so much so that the Court of Claims, on page 58 of the record, is moved to say:

> "If the ingenuity of scientists in this art had exhausted itself in the control mechanism of the Wright patent, it is not exaggeration to state, but clearly observable, that the modern airplane would never have been developed. * * *"

The Court's remarks apply equally to other attempts in the prior art.

Use of Ailerons and Elevator in Maneuvers.

All airplanes, in order to fly, must be capable of ascending, descending and banking. To ascend it is required that the pilot shall deliberately rotate or incline the plane to nose it up around its horizontal transverse axis. To descend requires that he shall incline it around this same axis to nose it down. To deliberately bank, or roll the plane, the pilot inclines the plane to the right or to the left around its longitudinal axis.

To do any of these things the pilot operates either the elevator or the ailerons, or both, in precisely the same way

that they are operated to incline the machine, nose down, nose up, roll right or left, to correct the attitude of the plane when the latter is disturbed, as has just been described.

Thus, whether the pilot utilizes the ailerons and elevator to incline the machine for correction or for maneuver, the operations are identical. In other words, the pilot uses exactly the same controls in exactly the same manner to produce the same inclinations, whether his objective is to keep the plane in balance at a level attitude or to change its attitude for some premeditated maneuver. It is not a case of organs performing two different functions; the elevator and ailerons each performs only a single function, and that single function is utilized by the pilot to incline the plane *for whatever purpose is desired by the pilot at the time.*

The Invention of the Patent in Suit.

We have already described the function of the old distortable wings such as warping wings or ailerons—which is that of turning or inclining the machine either to right or left around its longitudinal axis. We have also described the function of the old elevator—which is that of turning or inclining the machine around its horizontal transverse axis to nose it up or nose it down, or, in other words, to pitch the machine upwardly or downwardly.

The respondent, in the invention in suit, utilized these two old organs to perform their old and well-known functions.

He combined these organs with a single, universally-mounted lever wholly operable by one hand of the pilot for control of these organs. This was the first time that such result had been accomplished in the art. Others, perhaps, have approached it, but no one had accomplished it. This left the other hand of the pilot free for steering, throttle control, machine-gun fire, photography, writing reports, or any other duties imposed upon the pilot.

Respondent, further, segregated the steering control from the equilibrium control. He illustrated the use of a separate hand lever for this purpose. Steering is not ordinarily a vital control for safety, and the steering lever may ordinarily

be released without danger. With a hand steering lever, the foot is left free for the throttle. In modern planes steering is done by foot levers and the hand is left free for manipulating the throttle and other duties.

Perhaps more important than leaving one hand free, however, is the fact that by a single lever to control the inclination of the plane, the mind of the pilot is not confused by the necessity of two mental operations—one for the elevator, and one for the ailerons. Since a great majority of the operations of the control for equilibrium purposes are compound and involve both elevator and ailerons, the use of two hands imposes the necessity for two thoughts. This will be developed later.

Such single lever was *vertically arranged,* and the combination was such that when the lever was tilted forwardly, the elevator was tilted downward and the plane nosed downward. When it was tilted backwardly, the elevator was tilted upward and the plane nosed upward. When it was tilted to the *right,* the *left* wing was distorted to greater incidence and the plane turned or rolled to the *right;* and when it was tilted to the *left,* the *right* wing was distorted to greater incidence and the plane turned or rolled to the *left.*

Respondent's patented combination was such that any proportions of elevator and aileron action were obtained by the simple expedient of moving the lever in an oblique direction between forward and left or right, or between backward and left or right. That is to say, when the vertical lever was tilted in *any* direction, the effect was to incline the plane in *the same direction* as the lever was tilted. These unique responses have given rise to the phrases, "The plane follows the tilt of the stick," and "The plane tilts in the same way you tilt the stick"—which phrases are taught immediately to every student.

Ring-Tail.

The invention here in suit was based upon his second French application, which resulted in French patent No. 373,763, and was there shown as applied to an airplane hav-

ing a particular tail structure, known in the case at bar as the Ring-Tail. This is shown in Figs. 1, 3, 4, 5, 6 and 16 to 19 of the patent (Finding XIII, Rec. p. 17; op. p. 48).

In this construction respondent showed the old warping-wing type of lateral control. The longitudinal control organ was a two-part elevator which, so far as its effective aerodynamic structure was concerned, is identical with all elevators used in the practical art down to the present time. As before stated, an elevator is essentially a horizontal flap or surface hinged to the fuselage in some fashion so that its rear edge can be moved up and down. Its lower side is engaged by the stream of air when its elevator is down, thus forcing the plane to turn around its horizontal transverse axis to nose the plane down. When the elevator is swung up, its *upper* side is engaged by the air stream and the plane is turned around such transverse axis to nose the plane up.

The elevator of the ring-tail construction conformed to this description in all respects.

In detail it differed from the usual type—in that, instead of being mounted directly on the fuselage, it was mounted upon a ring, which in turn was mounted on the fuselage in such manner as to swing around the same horizontal axis as was the custom.

This elevator is connected to the same vertical lever which operates the warping wings, in the manner just stated, so that the complete control of all attitudes of the plane becomes resident in one hand of the pilot.

On the same ring which supported the elevator respondent mounted a two-part steering rudder, this rudder being essentially the same as steering rudders had theretofore been made. The only difference was that the common type of steering rudder had been mounted directly on the fuselage so as to swing around a vertical axis, whereas respondent mounted it on the common ring with the elevator and mounted the ring on the fuselage so that it would swing around such vertical axis.

Thus the ring-mounting for the elevator and steering rudder was given the capacity of swinging in two directions—one

around a horizontal axis for the elevator, and one around a vertical axis for the steering rudder.

But, while the elevator and steering rudder were mounted on the same ring, there their connection completely ended.

In no sense were they interconnected in any way. The steering movements were performed by a simple vertical lever arranged to be moved by the left hand of the pilot, the sole duty of this lever being to steer the plane.

The elevator movements were performed by the vertical lever, universally mounted, which also operated to warp the wings.

This lever, which speedily became known throughout the world as the "joy-stick," thus placed in one hand of the pilot the entire control of the attitude of the plane—with most important results, hereinafter referred to.

Bird-Tail.

In a later patent applied for in France on January 22, 1907 [Patent No. 373,818], this same joy-stick mechanism was applied to a very different form of tail structure, known in this case as the "bird-tail" structure. The patent in suit shows this structure in Figs. 7, 7ª, 8, 8ª and 10.

In the bird-tail form the old elevator and the old warping wings were both used in the same general form as they are to-day (ailerons being now substituted for the warping wings). With this familiar change, the bird-tail structure as an equilibrium or attitude control is substantially identical with all modern airplanes.

To lighten the plane, however, the respondent gave an additional function to the elevator, namely, that of steering. There was no necessity for this from the standpoint of the equilibrium control. Weight, however, was of great importance in the early days of flying, and it was solely to save the weight of a steering rudder that the supplemental function of steering rudder was given to the elevator.

As with the ring-tail form, this additional steering function did not in any way interfere with the functional independence of the equilibrium from the steering, and *vice versa*.

As with the ring-tail, the elevator and warping wing control was resident solely in the joy-stick, and the steering solely in a second, simple lever.

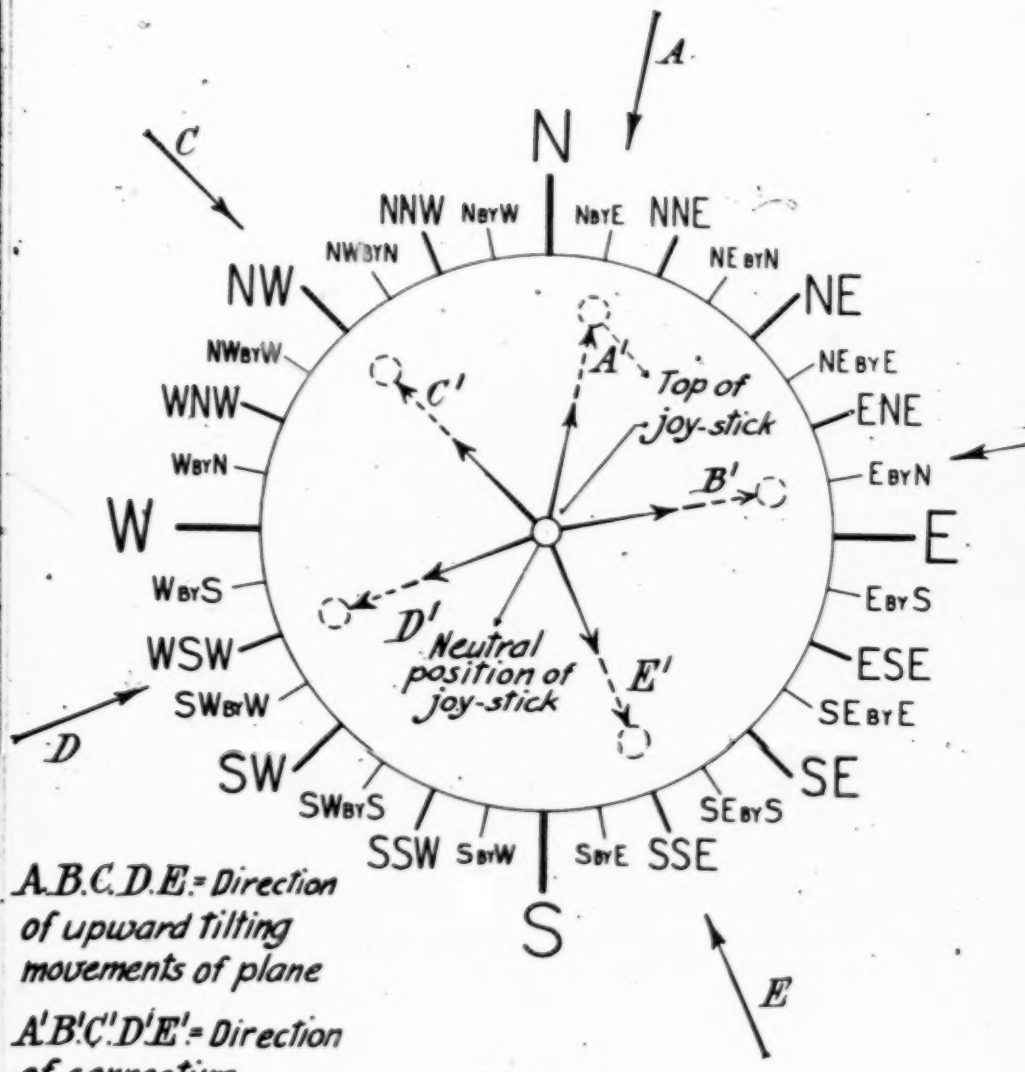
In each construction the respondent attempted to improve on the old separate elevator and steering rudder. In other words, he thought past the older forms, and essayed further improvements.

As motors of greater horsepower and lighter weight became available, the necessity for cutting down weight to the utmost in the airplane structure disappeared, and the ring- and bird-tail improvements became valueless.

In the first machine which respondent built and in which he made many flights, he utilized the lighter bird-tail form; but with better motors available, he soon went back to the old separately-formed steering rudder, and made thousands of planes in France using the joy-stick control.

In addition to the demonstration of the bird-tail by respondent, the ring-tail was amply demonstrated in July, 1931, by reconstructing about the cheapest plane on the American market (the "Aeronca") and flying it in many test flights, both *inter partes* and otherwise, during the trial of this case. The flights were completely successful and demonstrated that the joy-stick control of the equilibrium was separate and distinct from the steering control and that neither adversely affected the other. The same is true of the bird-tail; the findings are that the equilibrium was functionally separate from the steering, and *vice versa*, and that neither adversely affected the other (see Findings XIV-XVII).

Since the invention of the joy-stick control was essentially novel—quite irrespective of the particular and specific organs of lateral and longitudinal control—the patentee very properly claimed broadly the combination of lateral and longitudinal stabilizing organs and the single universal lever for manipulating them. None of the claims is limited to either the specific ring-tail or bird-tail embodiment.



A.B.C.D.E. = Direction of upward tilting movements of plane

A'B'C'D'E' = Direction of corrective movement of joy-stick

Plate 2.

OPERATION AND ADVANTAGES OF THE INVENTION IN SUIT.

This apparently simple invention solved in a remarkable way the problem of control of the airplane.

The Court will remember that the respondent started with two controlling organs, namely, the distortable wings, and the elevator. By his invention he produced a combination which in effect was the equivalent of *one single controlling organ*, operable at the will of the pilot to incline the machine in any one of an infinity of directions by a simple movement of the hand of the pilot in the direction in which the tilt was desired.

The two organs in question—namely, the distortable wings and elevator—had always been able to theoretically produce this physical result, if the degree and kind of aileron and elevator action were selected and proportioned accurately enough.

But never before had a single movement of one hand of the pilot been capable of producing any desired tilting movement of the plane in any direction required. And never before had the attitude of the plane been used as a direct index or indicator for determining the point toward which this single vertical lever should be moved.

The control of equilibrium by respondent's invention became simplicity itself. The pilot had only to observe which point of his plane was the highest and *move the lever toward that part*, or, to state it reversely, the pilot had only to move the lever toward that part *which he wished to lower*.

This is illustrated in plate 2 on the opposite page. This diagram is similar to plate 1 opposite page 6 and shows the joy-stick movements to correct the balance of an airplane when unbalanced at each of the five points shown in plate 1. A tilt of the plane at N by E as shown by the arrow A in both plates is corrected by a simple movement of the joy-stick from its central neutral position toward N by E as shown by the arrow A^1. Any other tilt, such as shown by the arrows B, C, D and E in both plates, is corrected by movements of the stick in the directions of the arrows B^1, C^1, D^1 and E^1, respectively.

The device has other remarkable advantages, which are as follows:

1. In the vital problem of balancing or stabilizing the plane, if a gust hits the plane in such fashion as to elevate the latter at any point in the circumference, as described, the pilot does not have to calculate mentally how much elevator control is required and how much aileron control, and whether nose-up or -down elevator, or right- or left-wing aileron is needed, and then translate this calculation into muscular action of his two hands. The invention does that for him, and tells him exactly where to move his single hand to make the desired combination of controls which will result in taking him out of a dangerous unbalanced condition. It is little wonder that respondent's invention very early in its history became known as the "joy-stick" control.

2. If the pilot desires to turn his machine around its longitudinal axis or its transverse axis, or any axis lying between the two, for the purpose of a premeditated *maneuver*, the operations have the same remarkable simplicity and directness. The pilot simply moves his hand to tilt the joy-stick in the direction in which he desires to tilt the plane, or, in other words, he tilts the joy-stick toward that part of the plane which he wishes to *lower*. The operation is precisely the same as when the pilot desires to tilt the plane back from an unwanted attitude, due to a gust or the like; *that is, he tilts the plane by moving the stick in the direction in which he wishes the plane to tilt.*

As hereinbefore stated, premeditated maneuvers are always made by the stabilizing mechanism, even in the theoretical art preceding flight. With the joy-stick mechanism in premeditated maneuvers—we have the same condition as in balancing, viz.: the pilot does not have to calculate how much right or left aileron and how much nose-up or -down elevator are required for a maneuver, and then translate these into accurate muscular reactions. He merely executes the simple movement of the joy-stick in the direction in which he wishes to tilt.

3. Another virtue of this invention is that it utilizes, and harmonizes with, the natural balancing instinct of the pilot. Every human being either has at birth, or speedily acquires, the instinct to balance himself in a vertical position. This is seen when one balances himself on a pitching vessel or a swaying train, or in many other conditions. If, for instance, a person is seated and his chair is tipped backwardly, he leans forwardly to maintain his vertical attitude. Conversely, if the chair is tipped forwardly, he leans backwardly; if it is tipped to the side, he leans to the opposite side.

In an airplane provided with the joy-stick control, if a gust hits the plane so as to nose it up, for instance, the pilot instinctively and automatically tends to lean forward. With his hand on the stick, this tends to tilt the stick forward. This is precisely the right movement of the stick to correct the unbalanced, nosed-up attitude of the plane. The same is true if the nose is thrown down or the plane is rolled to the right or to the left by air disturbances, or if it is thrown out of its proper attitude in any direction. The pilot leans in the direction from which the disturbance comes, which in turn moves the stick in the direction necessary to correct the altered attitude of the plane (Finding XII, Rec. p. 16; op. p. 50).

4. Notwithstanding the important results achieved by the joy-stick, as we have thus described them, the Court would not have an adequate idea of the virtues of the joy-stick if it conceived that the pilot sits in his cockpit with the joy-stick in neutral position, waiting either for an air disturbance or a wish to voluntarily change the attitude of the plane; that when the gust comes, or the wish seizes him to change his attitude, he moves the stick from neutral in the desired direction, and when the desired result is accomplished, he moves it back to neutral to await some subsequent disturbance or desire. This is not the case at all.

The control of the equilibrium of an airplane, particularly in gusty weather, and most particularly in taking off or landing, is quite similar to the steering of an automobile on a rough and uneven road—except that the airplane tilts in all directions and requires correction in all directions, while the automobile requires steering movements in only two direc-

tions. The similarity lies in the fact that the steering wheel of a motor car on a rough road is always being turned by the driver in one direction or another.

This is so with the joy-stick. One gust, swirl, cross-current or air pocket succeeds another rapidly. Before the correction for one disturbance is finished, another disturbance may be and frequently is upon the plane from a different direction. It is characteristic of the joy-stick that no matter in which direction it is tilted for a given correction, it can be moved *directly* in any other direction for the succeeding disturbance. Such movements are indicated or indexed by the attitude of the plane at the moment. Usually the movements of the stick are direct and in a straight line. But if the disturbances are such that they tend to move rapidly around the plane, so as to elevate different portions of the plane rapidly and successively, they can be corrected by similar movements of the joy-stick.

To put it briefly: The joy-stick does not require to be moved from neutral to any desired position. It will correct the attitude of the plane, or alter it to suit the desires of the pilot, *from any attitude to any attitude.*

In the opposite diagrammatic page we have shown a number of movements of the joy-stick. Figs. 1 to 4, inclusive, show simple longitudinal and lateral control movements. Figs. 5 to 8, inclusive, show compound longitudinal and lateral control movements. Figs. 9, 10 and 11 illustrate the facility with which any desired control can be accomplished, either by starting at neutral (corresponding ordinarily to a level condition of the plane) or starting *from* any attitude and moving *to* any attitude, by a simple movement of the stick in a straight line in one direction.

Fig. 12 shows a typical series of movements which occur in rapid succession within a very few moments, particularly in gusty weather or near the ground—such as in a taking-off operation. The Court will note that these are not a reproduction of any actual flight, but are illustrative merely—and to forestall any possible criticism, we would say that the amplitudes may be shown as over-extended for the purpose of clearness of illustration.

CONTROL MOVEMENTS OF JOY-STICK

Airplane is assumed to be pointed toward top of sheet

○ indicates top of stick in neutral position.

◌ indicates top of stick in displaced position.

⟷ indicates direction of manual control movement.

Pitch or "Nose" = Longitudinal control by turning plane around its horizontal transverse axis.

Roll = Lateral control by turning plane around its longitudinal axis.

Simple Pitching and Rolling Movements

Fig.1.

Nose Up

Fig.2.

Nose Down

Fig.3.

Roll Left

Fig.4.

Roll Right

Compound Pitching and Rolling Movements

50% Pitch - 50% Roll

(Other angular movements give all the way from 1% pitch and 99% roll to 99% pitch and 1% roll)

Fig.5.

Nose Up
Roll Left

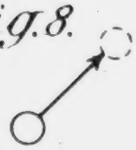
Fig.6

Nose Up
Roll Right

Fig.7.

Nose Down
Roll Left

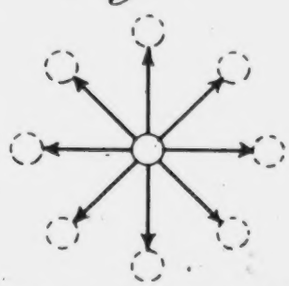
Fig.8.



Nose Down
Roll Right

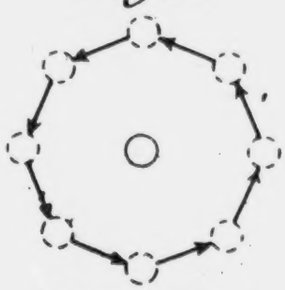
Diagrams Showing Various Possible Successive Control Movements of Joy-Stick to produce changes of plane from any attitude to any attitudes.

Fig.9.



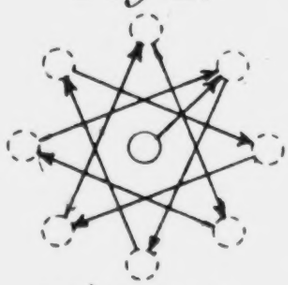
Simple or compound movements from neutral to any attitude

Fig.10.



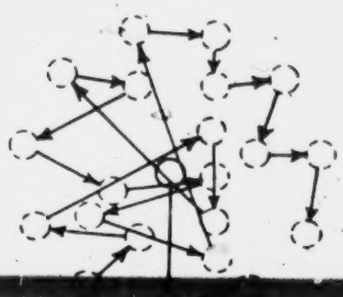
Rotary movements involving all attitudes except level keel

Fig.11.



All attitudes, crossing from one to another.

Fig.12.



Typical flying movements. Changes in control required to pursue a desired course and keep machine in balance for a few moments in gusty weather.

Each movement of stick produces a like tilting movement of plane, or opposes an opposite tilt of plane.

Such a succession of movements under the conditions named occurs in all planes, whether these be the petitioner's or the respondent's, or any other modern plane. Some of the movements are mainly premeditated maneuvering movements —such as gaining altitude, etc.; but, inextricably mixed with these are movements which the pilot is compelled to make, either for the purpose of balancing his plane or resisting unbalanced forces.

5. Even these complicated corrections which are thus simply solved by the joy-stick do not present the complete picture.

As we have previously pointed out, successful flight demands a constant state of balance of the plane. It must always be in a state of substantial equilibrium.

Every plane, however, must perform at least *some* maneuvers. These are premeditated changes in attitude of the plane from a level-keel position. Thus, every plane must move around its horizontal transverse axis to point the nose up in taking off and gaining altitude. Conversely, it must move around the same axis to nose down in descending and landing. It must bank, or roll to one side around its longitudinal axis in turning a curve. Petitioner's planes used in the Army and Navy must be put through very complicated, extreme, and hazardous maneuvers in their war evolutions.

Now, all of these maneuvers—which have to do with the attitude of the plane—are performed by the ailerons and elevator operated by the joy-stick, in precisely the same manner as equilibrium corrections. Both types are intentional, and they differ only in that in one they are performed under the stress of necessity and in the other because the pilot wishes to change the attitude of the plane to accomplish some intended purpose. In war planes, maneuvers are also frequently performed under mental stress—that is, in escaping an enemy squadron, or in diving, barrel-rolling, or the like, for gaining a favorable position for attack.

Now, in all maneuvers, as before stated, the plane must be kept in a stable attitude.

Let us assume the simple maneuver of the dive. This is accomplished by tilting the joy-stick forward.

But gusts, swirls, cross-currents, etc., *are not suspended by nature* when a pilot wishes to dive. They are just as prevalent when diving as in level flight.

In a dive, therefore, we have the pilot with his joy-stick tilted forward. Now his plane is hit by a gust or swirl, which throws it over on one side. He immediately corrects this improper attitude by tilting his joy-stick to the opposite side of the plane, without the necessity of altering his diving attitude.

The same is true of all maneuvers.

The necessity for *strict equilibrium control* is present in all maneuvers. The joy-stick superimposes on all of its movements for premeditated maneuvers, a constant stabilizing effect.

Both are indistinguishably mixed and commingled, and both are handled by the joy-stick mechanism in the simplest and most direct and effective manner.

6. Finally, but of great importance, is the lack of mental effort required by the pilot—which is of greatest value in all emergencies, of which there are many in flying.

The joy-stick, for any attitude correction, requires only the simplest mental effort. A single thought—namely, "tilt the stick towards the highest point of the plane"—or "tilt the stick the way you want the plane to tilt"—is sufficient for all corrections involving any required proportions of aileron and elevator effect.

For this simple mental effort we have coined the term "single-mindedness." A control might involve simple movements, but might require considerable antecedent thought to select in which simple direction or way it needed to be operated. Or, a control might involve a simple antecedent thought, but require a complicated mechanical movement to carry it out.

The joy-stick mechanism involves the acme of simplicity in operation in all emergencies and in antecedent mental effort.

None of the prior art structures approaches the joy-stick mechanism in either of these vital respects. All of them require two mental conceptions to keep the plane in balance or maneuver it, and many of them calculations of relative amounts of movement of the two equilibrium controls.

The Findings and Opinion of the Court of Claims.

In the ordinary case presented to this Court for review, the Court takes jurisdiction because of the fact that two different Circuit Courts of Appeal have rendered conflicting decisions as to the validity or scope of a given patent, or its infringement. In such cases the Court has before it the entire record in at least one of such cases, that one being the case in which the Court below is alleged to have erred. This Court, hence, has the opportunity of reviewing all questions of fact, passing on the competence and reliability of the witnesses, and arriving at its own findings of fact.

In a case arising in the Court of Claims, however, this Court has no such opportunity, since by Section 288 (Title 28, U. S. C.) the record below is not certified to this Court.

This Court has clearly announced from time to time, however, that in such cases the findings of fact of the Court of Claims are taken as final and conclusive (*Luckenbach* v. *United States*, 272 U. S. 533, 537).

We believe that this Court cannot fail to be impressed with the great care with which the Court of Claims examined all of the questions presented by this case. It is unusual that a patent case involving a single patent has been so exhaustively considered as the case at bar. Every point raised by the defense was examined with meticulous care, being patiently considered in all of its aspects.

The decisions of Judge Campbell and of the Circuit Court of Appeals in the *Chance Vought* case were vigorously urged at every step in the briefs and arguments and evidently very carefully considered by the Court of Claims. That the latter Court was forced by the logic of the case to its decision is apparent, among other things, from its remarks on page 61

of the record, where it states in effect that on a number of important questions in the case the record in the *Chance Vought* case must have been very different. In point of fact, it was; and, incidentally, we may suggest to this Court that as to any fact question, it can be of no moment what the Court of Appeals decided on a different record.

This case is not before this Court on appeal or other proceeding in the *Chance Vought* case. The case here for review is the suit against the United States, on the record which was present in that case. Unfortunately, under the provisions of Section 288 of the Judiciary Act, this Court cannot itself examine the long and extended record in this case, the testimony of numerous experts on the theory and practice of flying, the laws of aerodynamics, and the numerous tests which were made in wind-tunnels and in actual flight.

This is particularly a case where the well-known rule applies that the questions of validity, scope and infringement are questions of fact and not of law.

Bischoff v. *Wethered*, 76 U. S. 812-816;
Royer v. *Schulz Belting Co.*, 135 U. S. 319;
Thomson Spot Welder Co. v. *Ford Motor Co.*, 265 U. S. 445;
Stilz v. *United States*, 269 U. S. 145-147.

Having in view the fact that the case here at bar is the suit against the United States, and that the opinion on review is that of the Court of Claims: we submit, with confidence, that this Court will restrict its review to a consideration of whether or not there was error in the application of law by the Court of Claims. This Court has announced that its review of Court of Claims' cases is limited to questions of law.

Luckenbach v. *United States*, 272 U. S. 533.

Unless we are mistaken, the only pertinence of the *Chance Vought* decision is that its existence has induced this Court to examine with care the decision of the Court of Claims to ascertain whether that decision is well founded and involves any serious defect of law.

We believe that the Court will find no errors of law in the Court of Claims' decision. That Court was showered by the petitioner with alleged authorities, none of which was pertinent. Once the facts before that Court are understood, its law, it is believed, will be found impeccable. The main facts as adduced in this case are extremely simple. Many efforts have been made to provide a really effective control of the inclination or attitude of heavier-than-air machines. The proper organs were in existence, but no means had been discovered which were adequate to enable the pilot to change the attitude of the machine under the rapidly changing and hazardous conditions of flight. There were attempts all around the invention of the suit at bar. None of them was successful. The masters of the art—the Wrights, Curtiss, Langley and others—had not been able to produce the desired control. Respondent produced it in 1907 with such complete success that, like the umbrella, it has never been improved upon but is standard construction throughout the world. The petitioner's machine, as all modern machines, uses exactly the same mechanism—differing only in details. That is the sum and substance of the case. As in every important case, the petitioner has gone to great lengths in trying to anticipate it. It has invented new theories as to the lack of infringement, which would deceive no one who adequately knew the facts.

The Court of Claims perceived these salient facts and the inadequacy of the many defenses. The Court of Appeals did not; probably because of the lack of a proper record, it went completely wrong on important facts and important law.

There is but one point of law contained in the Court of Claims' opinion with which we desire to take issue—and that is, the exact status of respondent's 1906 French patent. This point is, we believe, a completely new one and is not necessary to the decision of this case if this Court follows the Court of Claims—as we believe it will—in deciding that the patent in suit covers a clear and meritorious invention over the 1906 structure when the latter is treated as the equivalent of prior art.

Petitioner's Brief.

One would suppose that the petitioner in its brief would take issue with the Court of Claims on concrete points of law. Instead of this, we find the petitioner's brief undertakes to argue the entire case *de novo*. But scant attention is paid to the findings of fact of the Court of Claims, and but little attention is paid to the rule that these fact findings are based upon a complete record not present in the *Chance Vought* case. This record comprises several thousand pages, containing the testimony of numerous experts, actual test flights, wind-tunnel tests, expositions of the laws of aerodynamics, etc.

The petitioner's brief contains numerous misstatements of fact and a wealth of misapplied citations. The most important of these will be noticed later.

There are several points appearing in the petitioner's brief which are of general application and which it would be well to notice here.

The first of these is the statement that the patent in suit is a detailed improvement upon respondent's 1906 French patent. Attempt is made to bolster this up by reference to the French law. The French law provides that a patentee shall have the sole right for a period of one year of obtaining improvement patents. Since the two French patents upon which the patent in suit is founded—namely, the second and third (Nos. 373,763 and 373,818)—were applied for within the year, the argument is that they must be for detailed improvements. This is a complete *non sequitur*. The joy-stick invention was first shown in respondent's second French patent, No. 373,763—applied for within the year after the application for respondent's 1906 patent. But it does not even mention the 1906 patent. It certainly makes no statement that it is for a detailed improvement. On petitioner's theory, any invention shown in an application, no matter how remote, must be for a detailed improvement if it is filed within the year. The Court of Appeals fell into this very obvious error in the *Chance Vought* case.

The 1906 structure was an abortive attempt to provide an adequate control. Doubtless it foreshadowed to a certain extent the invention in suit, in that it attempted to control the equilibriums with a single hand. But it did not succeed because the other hand of the pilot must be used in order to render the equilibrium control effective. This will be referred to later.

Petitioner also attempts to belittle the invention of the patent in suit and maximizes the 1906 structure on the ground that when the application for the patent in suit was first prepared and sent to the United States, it included the 1906 structure. This was afterwards stricken out. The 1906 structure was patented in France. The two 1907 structures covered by French patents Nos. 373,763 and 373,818, upon which the patent in suit is based, were certainly to related inventions. It is not uncommon that the first effort of an inventor to solve a problem is crude and impractical. And it is not uncommon practice, both here and abroad, to file applications which include a series of related inventions. If a claim can be obtained in this country broad enough to include them all, well and good. This was evidently the respondent's idea in preparing his first application. The 1906 structure was so imperfect that it was never built, either at the time or at any time thereafter. But, as before stated, it had the germ of an idea and it was proper enough to cover it in this country. In this respondent failed because of the delay in transmittal of the application papers. Respondent's inventions of the second and third applications in France turned the failure of his first application into complete success. The papers were revised and filed in the United States Patent Office. There is nothing mysterious about these circumstances, nor do they in any way minimize the importance of the invention at bar.

Petitioner also complains that, if the invention in suit was so immeasurably superior to the 1906 structure, it was strange that it was produced within a month after the 1906 structure. Of course, such arguments mean nothing. An invention is not measured by the duration of the period taken to produce it.

Summary of Pertinent Facts as Found by the Court of Claims, Which Are Not Subject to Review.

When these facts, which must be accepted as true in this case, are analyzed, it will be found, we submit, that they negative every fact contention of the petitioner and leave to this Court only the duty of ascertaining whether the law invoked by the Court of Claims is good or bad.

The salient facts found are as follows:

1. Respondent's 1906 French patent, No. 372,753, is a two-handed structure, being inoperative if either hand is released. For longitudinal equilibrium control, the plane assumes an inclination opposite to the inclination of the right-hand lever. The right- and left-hand levers are interconnected, so that it is essential that the pilot continuously keep hold of both levers (Finding IV, Rec. pp. 7-8).

2. The specification of the patent in suit as filed showed the invention in suit in substantially the same manner as it appears in the patent as granted (Finding VII, Rec. p. 10).

3. The specification and drawings to which the original claims made reference disclose vertical levers for steering and for equilibrium control which operated exactly as those described in the patent in suit as granted (Finding VIII, Rec. pp. 11-12).

4. Original claim 4 as filed was directed to separate levers for controlling the distortable wings and both rudders (Finding VIII, Rec. pp. 11-12).

5. Claim 2 of the patent in suit is the same as claim 2 of the amendment filed on February 1, 1909 (Findings VIII and IX, Rec. pp. 12-13, giving the claim in full).

6. Lateral equilibrium or attitude control rolls the plane around its longitudinal axis; longitudinal equilibrium or attitude control inclines the plane either downward or upward, as in descending or ascending. Rolling caused by lateral control not only regains lost stability but banks the plane (Finding X, Rec. pp. 14-15).

7. It frequently occurs that both longitudinal and lateral equilibriums are simultaneously disturbed and a simultaneous correction is required, in the majority of instances, of equilibrium or attitude control (Finding X, Rec. p. 15).

8. An airplane may be constructed with a certain amount of transverse and lateral stability inherent in its structure. The banking and elevational controls with such machines have a superimposed stabilizing tendency upon the plane and are used by the pilot for this purpose. The banking and elevational controls function respectively as lateral and longitudinal equilibrium controls (Finding XI, Rec. pp. 15-16).

9. Man has an instinctive balancing sense; and an equilibrium control comprising a vertical lever universally mounted to incline in any direction and which, when thus inclined in any vertical plane, causes a corresponding movement of the whole airplane, tends to eliminate a material part of the conscious mental effort of the pilot with respect to equilibrium control (Finding XII, Rec. pp. 16-17).

10. The disclosures and description contained in the patent in suit are of sufficient fullness to enable one skilled in the art to practice the invention disclosed by the patent in suit and defined by the phraseology of the claims (Finding XIII, Rec. pp. 17-19).

11. In the bird-tail structure, any cross responses do not impair the operativeness of either the right- or left-hand lever and each lever performs its function regardless of the position of the other lever (Finding XIV, Rec. p. 19).

12. In the ring-tail structure, cross responses do not impair the operativeness of either the right-hand or left-hand control lever and each lever performs its function regardless of the position of the other lever (Finding XV, Rec. pp. 19-20).

13. The ring-tail structure is operative in actual flight: the steering and stabilizing levers are mechanically separate and independent, and each lever performs its function regardless of the manipulation of the other lever (Finding XVII, Rec. p. 21).

14. Minor cross responses are present in all airplane controls (Finding XVIII, Rec. p. 21).

15. The control systems of the Curtiss, DeHaviland, and Loening airplanes complained of have means for controlling the transverse and longitudinal equilibriums, or pitch and roll of the airplane, comprising a vertical lever universally mounted at its lower end which operates the ailerons and elevator. The operation is such that when the lever is pushed forward, these airplanes nose down; when it is moved backward, the airplanes move up; when it is moved to the right, the airplane rolls to the right; and when it is moved to the left, the airplane rolls to the left. When the lever is moved in any intermediate position, the movement of the airplane produced corresponds to the degree of inclination and direction of movement of the lever (Finding XXI, Rec. pp. 22-24).

16. Each of these three planes has wings, a portion of which is hinged so that the contour of the wing surface may be altered and the angle of attack changed for the purpose of controlling the roll or transverse equilibrium. Each has a rudder pivoted on a horizontal axis for controlling the longitudinal equilibrium or pitch. Each has a universally-mounted vertical lever for operating it, and the inclination of this lever is followed by a similar inclination of the plane. The responses of the plane accord with the instinctive balancing sensations of the pilot. The steering rudder is operated by a separate lever.

The equilibrium control lever of the three airplanes has the same controlling functions as the equilibrium control lever of the patent in suit (Finding XXII, Rec. pp. 24-25).

17. The prior art patents show structures which lack the characteristic construction and operation of the patent in suit, as follows:

Penaud & Gauchot (Finding XXV, Rec. p. 26)—No transverse equilibrium; lever for elevator, handle-bar for steering;

Davidson (Finding XXVI, Rec. p. 26)—No manual control, and construction inoperative;

Macedo (Finding XXVII, Rec. p. 27)—Longitudinal control a foot lever; transverse control and steering by a fore-and-aft lever having a steering handle-bar at the top; foot and two hands necessary for equilibrium control;

Laroze (Finding XXVIII, Rec. p. 28)—Longitudinal equilibrium by pivoted column; lateral equilibrium by handle-bar movement of wheel; steering by rotation of wheel; two-handed control of equilibrium;

Schüssler (Finding XXIX, Rec. p. 29)—No equilibrium controls;

Jung (Finding XXX, Rec. p. 29)—Dependent swinging lever for elevator; no transverse equilibrium control; no steering;

Wright (Finding XXXI, Rec. p. 30)—Body cradle for lateral control inseparately fixed to steering; movable roller for elevator;

Wadsworth (Finding XXXII, Rec. p. 30)—Universal vertical lever for actuating one mechanism by one movement and a second mechanism by a movement at right angles to the first; no mention of aviation or equilibrium control of an airplane;

Weeber (Finding XXXIII, Rec. p. 30)—Universally-mounted lever for controlling steering and braking device for automobiles; no mention of use in connection with equilibrium controls of an airplane;

Hartness (Finding XXXIV, Rec. p. 30)—Boat attachment for balloons; horizontal universal lever for steering rudder and elevator;

Quentin (Finding XXXV, Rec. p. 31)—No control of longitudinal or lateral stability;

Wilson (Finding XXXVI, Rec. p. 31)—Horizontal universal lever for electrical circuits; and

Simpson (Finding XXXVII, Rec. pp. 31-32)—Hydroplane boat with universal vertical lever and wheel connected with hydroplane surface for changing posture of boat; pilot winds up wheel to emerge boat, and tilts lever to control incidence of the hydroplane.

18. Bleriot and Farman planes were brought to this country in 1910 and 1911 for exhibition flights. Some airplanes were built in this country. These several planes employed the characteristic joy-stick construction and mode of operation. None was in the United States when the application for the patent in suit did not contain either claim 12 of February 1, 1909, or claim 13 of February 1, 1909, or the claims in suit (Finding XXXVIII, Rec. p. 32).

19. Two types of planes were in use in the United States in 1912: Wright and Curtiss. The lateral control of Wright was a fore-and-aft lever; the longitudinal control, a fore-and-aft lever; steering, small tilting lever on lateral control. The lateral control of Curtiss was a shoulder yoke; the longitudinal control, a fore-and-aft lever; steering, by a wheel on the longitudinal lever (Finding XXXIX, Rec. p. 33).

20. The Ferber booklets contain no disclosure of the invention in suit (Finding XL, Rec. p. 33).

21. Ferber's experiments in France: Steering and lateral controls by single airfoil surfaces (Finding XLI, Rec. p. 34).

22. The Vautrin sketch relates solely to elevational and directional rudder; no lateral equilibrium control. The phrase "in prior legitimate and personal possession of the invention" means secret possession or knowledge legitimately obtained of a patented invention prior to the application for patent (Findings XLII to XLVI, Rec. pp. 35-37).

23. Control of airplanes having the construction and mode of operation of the patent in suit was widely adopted in France and in the United States. It was generally used in the United States in all but heavier types of machines, which, because of their comparative size and weight, require a greater controlling force than can be conveniently applied by the pilot to a simple vertical lever. This control system is the most satisfactory control ever had from the standpoint of training and from the standpoint of minimum amount of attention required (Finding XLVII, Rec. pp. 37-38).

I.

Argument.

We think it will assist the Court in a study of this case if we adopt the same order that the petitioner has adopted in a discussion of the various questions presented in so far as this may be possible.

With this in view, we will use numbers and titles corresponding to those of petitioner's brief.

In the previous pages of the present brief we have pointed out the extraordinary hazards of aviation, the complicated conditions under which an airplane flies at all, and the way that the problems of control of equilibrium were solved by the invention in suit.

The problems of heavier-than-air flight are unique. Nothing approaching them exists in any other art. The problems would be complicated enough if it were merely a case of a body floating in space and subjected to movements in all three dimensions, such movements not only relating to balance but also to bodily movements of the plane. An airplane has all these, and much more. It can only keep aloft, as we have before pointed out, by high speed. Reducing this speed below a minimum high velocity causes a collapse of the entire phenomenon of flight. If the airplane gets badly out of balance, the same thing occurs.

It is very obvious, therefore, that there is no other art which is analogous to it. What can be learned from one art would aid the aviator not at all in any problem involving the phenomenon of flight. Of course, a screw will hold a block in an airplane, or on a wall, or on a piece of furniture. A lever will move another device of an airplane as a mechanical proposition; a cleat will hold a cord, and so on.

Other mechanical contrivances are known of general application.

But these have nothing to do with the phenomenon of flight and the great problems which had to be solved in making flight successful.

When petitioner, therefore, argues about patents of the type of Wadsworth, Weeber, and the like, it is relying upon devices in arts which are in all senses of the word alien.

None of them apparently made any impress upon its own art, or came into practical use.

The Court of Appeals can scarcely be said to have looked upon the patent in suit with a favorable eye, but even that Court excluded all art which was outside of the art of aviation. As to this point the Court of Appeals and the Court of Claims are precisely in accord. There is no conflict, and, as we take it, this Court will not review such a question of fact where the lower courts do not differ (*Thomson Spot Welder Co.* v. *Ford Motor Co.*, 265 U. S. 445).

Even Judge Campbell excluded the patent to Essberger & Geyer for an electrical apparatus for controlling cranes (56 Fed. [2d] 393, at 399). Judge Campbell did include the patent to Weeber, which is present in this case, and the patent to Glazier, both of which related to motor vehicles (same page); but Judge Campbell's reason for doing this is curious. He states that both employ combustion engines, and that motor cars—

> "* * * as do aeroplanes, in taking off and landing, move on the ground."

In other words, Judge Campbell admits as analogous art a motor vehicle control because an airplane, *when it is not acting as an airplane at all,* moves on the ground. What the taxiing of an airplane has to do with the phenomenon of flight is not explained by the Court. How the control of a brake or what-not in a motor car bears any resemblance to the totally different problem of maintaining the equilibrium of an airplane is not disclosed (see op. Rec. p. 65).

With these preliminary remarks we will pass to a short discussion of the prior patents.

A.

Prior Patents.

The petitioner argues that the United States patent to Wadsworth, No. 213-079, of March 11, 1879, discloses a single vertical lever mounted on a universal joint for operating two devices and anticipates the invention in suit. This is because Wadsworth states that it is his object to control through one lever or handle the simultaneous or independent action of engines or mechanisms so that they may be worked singly, together, or in opposition (Wadsworth Patent, Defendant's Exhibit D-112, lines 10-14). The petitioner states that, thus, the invention is a generic one and is not limited or restricted to a specific art, and cites certain cases which are not in point in support of its argument.

If this reasoning were followed, it would go far to negative some of our most important inventions. Levers, cams, cogs, and many other mechanical devices are all old, and yet there is rarely a mechanical patent which does not employ one or more of them.

The plain answer to petitioner's argument is: Why should anyone use the Wadsworth lever for the control of airplanes? Who knew or appreciated that it was of any utility? The recognized masters of the art of flying—such as Wright, Curtiss, Langley and others—gained absolutely nothing from Wadsworth, whose patent was taken out in 1879. The Wrights in their epoch-making flight at Kitty Hawk used a construction which formed their basic patent, No. 821,393, and this structure did not have a lever of any kind or description in the whole airplane. Curtiss used a lever for his elevator and a shoulder-yoke for his ailerons. The Wrights later used an elevator lever with a steering lever on top of it. None of these masters had the gist of respondent's invention—which was that, of all conceivable methods of control, the combination of the two equilibrium controls in a single hand operated by a vertical lever, the movements of which were indexed by the position of the plane, was the only control which would adequately take care of the extreme hazards of flight.

Wadsworth contributed precisely nothing to this.

But, still more: Wadsworth's suggestion was to operate two unlike mechanisms for mere convenience.

Respondent's conception was to take the ailerons and the elevator which have effective operations at right angles to each other, and produce from these two organs what was *in effect a single organ having operative effect entirely around the airplane* so as to balance the plane against disturbances in attitude from every direction by a simple movement in the direction in which it was necessary to tilt the plane for correction.

This conception was so immeasurably beyond anything which Wadsworth had in mind or disclosed that, even if the Wadsworth patent could be tortured into an analogous art, it would still completely fail to anticipate the novel ideas involved in the invention at bar.

Petitioner is simply doing the old, old thing of taking a brilliant conception, picking apart its mechanism, and finding similar mechanisms in other arts. There are almost no inventions that cannot be similarly dissected. The vice of it is that such a dissector must first have the invention in order to tell him what parts he must look for among prior patents and then how to use such parts.

This Court has so many times refused to follow such reasoning that it is scarcely worth while to cite decisions.

The same reasoning applies to Weeber, Wilson and Simpson. The Simpson structure in addition has essentially a two-handed control. If one hand is used on Simpson's wheel to control the longitudinal or lateral posture of the boat, it invariably will produce a lateral or longitudinal change as well. Simpson's column is not a true lever since its operating part, the wheel, has no fixed fulcrum. Simpson has much the same vices as Laroze (op. Rec. p. 64).

There is one point in petitioner's discussion that deserves an answer (Petitioner's Brief, p. 25): this is the statement that none of the patents here discussed was cited by the Examiner during the pendency of the application in the Patent Office and that this circumstance enhances their importance as anticipatory references.

The fact happens to be that the Patent Office had before it a patent in the art of aviation which—while it did not apply to heavier-than-air machines, and hence did not attempt to solve any of the equilibrium problems of heavier-than-air flight—still might be said to be in a much more analogous art than any of the patents we have discussed. That was the patent to Hartness, No. 168,486, of October 5, 1875, which related to a car or boat attachment for balloons. It showed a universal lever at the rear of the balloon car, this lever operating an elevator and a steering rudder. It is discussed in Finding XXXIV (Rec. p. 30). This patent was discarded by the Patent Office, presumably for the very obvious reason that it did not disclose the invention in suit; this latter does not put the steering and elevator in one hand, but the *elevator and ailerons*. Unless these two equilibriums are under the control of one hand, the invention is not realized.

Laroze (Defendant's Exhibit D-6). On page 26 of petitioner's brief it is stated that this patent is a direct anticipation, "for it discloses a single vertical lever which by its various movements controls the lateral and longitudinal equilibrium of an airplane." This patent is considered in Finding XXVIII, which shows that the petitioner's statement is obviously in error. The frailty of this Laroze control, its hopelessly confusing nature, and its lack of value in comparison with the joy-stick are so forcibly set forth in the Court of Claims' opinion (Rec. p. 62) that we can add but little to the Court's remarks. It is distinctly and inevitably a two-handed control, requiring both hands for any equilibrium movements. So far as the equilibriums are concerned, the Laroze control does not consist of a single lever universally mounted. It consists of a simple lever with a handle-bar at the top, since Laroze's wheel controls the transverse equilibrium by a handle-bar movement. It would take a daring pilot indeed to navigate a plane equipped with the Laroze control. Laroze was cited and withdrawn by the Patent Office.

Wright (Plaintiff's Exhibit 50, discussed in Finding XXXI, Rec. p. 30). As the first persons to ever make mechanical flight, the Wright brothers are entitled to all the

encomiums which can be showered upon them. But, as inventors of an adequate equilibrium control, we have only to say that they themselves speedily discarded their own structures as set forth in their basic patent, No. 821,393. In that patent the Wrights explained that when a wing is warped to correct a transverse tilt, it produces a drag, which causes the other side of the plane to move more rapidly and, hence, turn the airplane in a steering sense. To offset this, they fixedly connected their warping wing control with the steering rudder, so that they must be operated together. Steering without warping is impossible, and warping without steering is impossible. The mechanism for producing this effect was a sliding cradle upon which the pilot lay prone, shifting his body from one side to the other. The elevator was operated by a completely separate mechanism, comprising a roller which was twisted by the two hands of the pilot as he reposed upon the cradle. Of this the Court of Claims correctly states:

> "If the ingenuity of scientists in this art had exhausted itself in the control mechanism of the Wright patent, it is not exaggeration to state, but clearly observable, that the modern airplane would never have been developed. We think we may with confidence assert that there is not a single airplane patent cited as prior art that does not embody attempts to not only simplify a control mechanism, but concerted efforts to create one capable of functioning efficiently, and following the demonstration of the possibility of flight by the Wright brothers, inventors turned their attention to this important feature of airplane control" (p. 58).

Penaud & Gauchot, French Patent No. 111,574. In this structure there is no control of transverse equilibrium whatever. It had a dihedral arrangement of its wings. Its steering and longitudinal equilibrium controls were united in a single device, both hands being required either for longitudinal equilibrium or steering. There is no disclosure of the direction of the response of the longitudinal equilibrium control (Finding XXV, Rec. p. 26).

Davidson, British Patent No. 13,700 of 1898. This patent shows an attempt at an automatic control, using a pendulum for this purpose. It has nothing in common with the joy-stick, and is inoperative because of the disturbing effects of inertial and centrifugal forces. The idea of stabilizing an airplane by automatic mechanism has always been an attractive one, but never until a very recent date has any progress been made along this line. We understand that there is now on the market a device of this type, but that it is not capable of stabilizing the plane in taking off, landing, or near the ground—being useful, however, on long flights at high altitude to relieve the pilot (Finding XXVI, Rec. pp. 26-27).

Macedo, French Patent No. 290,488. In this device the longitudinal equilibrium control is operated by a foot lever, the movement of which produces an opposite response to that of the joy-stick. The transverse equilibrium control is united with the steering control, and the response of the plane is at right angles to the movement of the transverse control (Finding XXVII, Rec. pp. 27-28).

Schüssler, German Patent No. 85,326. This structure has no equilibrium control, being a depending rod used for steering (Finding XXIX, Rec. p. 29).

Jung, German Patent No. 129,146. This patent has no means for controlling transverse equilibrium and no steering means (Finding XXX, Rec. p. 29).

Hartness, U. S. Patent No. 168,486. This patent relates to a car or basket for a balloon. It has an integral elevational and steering rudder mounted on a single lever, which is in turn mounted on a universal joint. The responses of the car are opposite to those of the joy-stick. There are no lateral stabilizing means (Finding XXXIV, Rec. pp. 30-31).

Quentin, British Patent No. 3,872 of 1892. This structure has no means for producing or controlling longitudinal stability and no means for producing or controlling lateral stability (Finding XXXV, Rec. p. 31).

Respondent's 1906 Patent. Assuming that this patent is prior art, it shows a construction in which two horizontal

levers are employed to rotate the entire wings of an airplane. For all longitudinal equilibriums, or equilibriums in which there is a longitudinal component, which comprise a great majority of equilibrium movements, the right-hand lever is dependent upon the left-hand lever for its movements. If the left-hand lever is released, the right-hand lever is inoperative. The pivoted wings are released from control, and the whole plane becomes out of control. The structure, hence, requires the constant use of both hands and two mental operations. It entirely lacks the self-indicating operation of the patent in suit; the plane does not follow the tilt of the stick, and the operation is not such as to take advantage of instinctive balancing as to its longitudinal equilibrium.

This sums up a discussion of the prior art structures. In none of them is there (1) a single-handed control of both equilibriums; (2) a plane which as to all of its equilibriums follows the tilt of the stick; (3) a plane in which its attitude constitutes an index or indicator towards which the control lever can be moved in a simple, direct way to make any necessary correction; or (4) a plane in which the corrective movements of the equilibrium control accord with the instinctive movements of the pilot.

The effect of this prior art upon the airplane industry in the United States was practically *nil*. Prior to the time when respondent's invention was introduced into the United States, we find that the Wright brothers changed to a control in which there were two single levers mounted adjacent the pilot's seat, one of which moved forward and aft for lateral control and had on its top a small tilting lever swinging right and left for steering. The left-hand lever controlled the elevation and depression. This Wright control was one of the standard controls in the United States in 1912. It was not prior art. Here the Wrights, while *mechanically* separating steering from lateral or transverse control, still continued to put them under one hand of the pilot (see Finding XXXIX, Rec. p. 33).

The Curtiss control, which constituted the other standard control of 1912, consisted of a shoulder-yoke mounted on the

back of the pilot's seat and strapped to the pilot's body. A simple lever moving fore and aft controlled the elevator, and steering was accomplished by a wheel mounted on the top of the lever. This Curtiss control was a much later development than the invention in suit (Finding XXXIX, Rec. p. 33).

When all is said and done, the actual effect of all prior patents upon the practical and commercial art up to 1912 was represented by these two controls. If there had been any possibility that Wadsworth, Weeber, Laroze and others could have pointed the way toward a practical control, it should have appeared in these two standard controls of Wright and Curtiss.

In neither were the two equilibriums under the control of a single, universal lever. In both the steering was associated with one of the equilibriums.

Both of these controls were discarded when the United States entered the war and sent its aviators abroad, where the joy-stick control was in practically universal use.

When the petitioner argues that there were only three controls and a small number of possibilities as to combination, and that it required no invention to produce the invention in suit, it is flying in the face of actual practical experience of the commercial art developed by the acknowledged leaders in aviation.

The fact of the matter is that there were dozens of possible ways to control an airplane as to equilibrium. There were levers, slides, wheels, handle-bars, cylinders—all of which had been used. The ideal control might have been any one of these (or it might have involved none of them), combined in any one of a number of different ways with the various control organs.

We are referring to this especially, since the Court of Appeals fell into the same error as petitioner. Once the respondent discovered the perfect control, as we have before stated, it becomes very easy to analyze it, dissect it, and find its parts in the art.

This art is peculiar—in that, while the Wrights did not fly until 1902, about every principle of flight had been referred to in prior literature and patents. The petitioner refers to the patent to Penaud & Gauchot, which was an astonishing production for its day (1876). Inventors had long known that they had to control equilibrium to obtain successful flight, and had provided many types of mechanism for such control. Nearly every problem had been worked out prior to the actual fulfilment of the desire for mechanical flight, except the problem solved by respondent.

B.

PRIOR PATENTS NOT IN ANALOGOUS ARTS.

On page 34, petitioner's brief, petitioner under the heading "The Prior Patents Are in Analogous Arts" discusses those patents of the Wadsworth type which both the Court of Claims and the Court of Appeals discarded.

We have already discussed much of this ground beginning at page 31 of this brief.

Petitioner, however, attempts to point out some analogies with the idea of rebutting what appears to be the unanimous opinion of the Court of Claims and the Court of Appeals. But none of the analogies referred to has any bearing upon the case at bar.

We scarcely need to refer this Court to its own many decisions with regard to analogous arts. The latest of these is, we believe, *Powers-Kennedy Contracting Corporation* v. *Concrete Company*, 282 U. S. 175. In that case the patents upheld as prior art all dealt in the handling of similar material.

The distinguishing feature of the case at bar is that there was a crying need for a simple, direct, self-indicating, instinctive control for the stabilizing organs of an airplane. No one had any idea whether such a control would ever be found, or, if found, what it would be like, or what it would involve. The best minds in the art were puzzled by the problem and advanced solutions which were immediately discarded when respondent's invention became known. The

problems were unique and the solution of them depended upon the discovery of how they could be solved. Here was no case of pushing an airplane by a propeller when a boat has already been pushed by a propeller. Nor was it a case of using the same mixing device for concrete that had already been used to mix tea or grout or other substances. We will not weary the Court by a detailed analysis of the profusion of cases cited on page 75 of petitioner's brief. None of them is in point in the case at bar.

C.

The Respondent's Device Involves Invention of High Order.

On page 36 of petitioner's brief, under the title "The Device Does Not Rise to the Dignity of an Invention," petitioner repeats much of the same argument that we have already considered.

Again petitioner cites many decisions which are not in point.

These considerations were all urged upon the Court of Claims and many of the decisions cited. The latter Court discarded them as not applicable.

We have already answered in most part the contentions of petitioner under this heading. They are essentially grounded upon bad law.

The aviation industry is not only a very important industry commercially, but it is a vital arm of defense to this country. The government is by far the largest user of airplanes in the United States.

No user is more dependent upon and has reaped so much advantage from respondent's invention as the government.

The salvation of the government airplane service as an arm of defense is to a very large degree dependent upon the the use of the joy-stick. In combat the maneuvers for machine gunfire, etc., are extremely rapid and complex, and necessarily so. The planes are repeatedly thrown into positions of great danger from the standpoint of equilibrium. In fact,

every facility of the airplane is strained to its utmost in combat and scout flying.

The extraordinary ease of control of an airplane for all purposes by the joy-stick is of tremendous value. The pilot has almost constant use for one of his hands outside of the equilibrium control. He is in constant danger both on account of his rapid and complex maneuvers and stabilizing and on account of the danger of enemy fire. The joy-stick control is so simple, direct, positive and instinctive that it calls for the very minimum of mental operation or conscious thought.

Contrast this, for instance, with the best control that Wright produced or Curtiss or Laroze with the complications and necessity for two-handed control of equilibrium and the value of respondent's invention is apparent.

The fact that the joy-stick has been adopted throughout the world as the standard control is but another evidence of its value.

To say that this involved no invention over the two-handed failures of the prior art, which required two mental operations for every equilibrium or maneuver control, is an insult to the intelligence.

D.

The Instinctive Character of the Joy-Stick Control.

Starting with page 38 of petitioner's brief, under the title "There Is No Merit in the Contention that the Element of Invention Is Found in the Alleged Instinctive Character of the Operation of the Control Lever," petitioner has devoted many pages to a discussion largely composed of erroneous statements of fact and law.

The Court of Claims has found as a fact that instinctiveness in a control is of value, and eliminates a material part of the mental effort required in operating it (Finding XII, Rec. p. 16; op. Rec. pp. 50-51).

In order that this Court may understand this particular question clearly, we state respondent's position as follows:

1. Respondent is the first in the art to produce a mechanism in which the entire control of equilibrium of the plane is in one hand of the pilot, so that a single mental operation and a single muscular response are all that is necessary in its operation.

2. Respondent is the first to provide such a mechanism with a single lever as the manual operating part which the pilot grasps.

3. Respondent is the first to arrange such a lever vertically so that the tilt of the plane in all of its attitudes constitutes a true indication or index of the proper corrective movement of the vertical lever, either to compensate for an unbalanced attitude or to make a premeditated maneuver.

4. Respondent is the first to completely divorce the steering function from the one-handed control of the equilibrium.

5. Respondent is the first to produce an equilibrium control, all of the corrective movements of which are in consonance with the reflex balancing movements of the pilot so that all corrective movements are aided and not hindered by such reflex balancing movements.

The so-called instinctiveness of respondent's control is due to the same combination of responses that make possible the mode of operation by which the plane follows the tilt of the stick.

That is to say, in respondent's single lever stability control of inclination the mechanism so operates that when the stick is tilted forwardly the nose of the plane tilts downwardly; when the stick is tilted rearwardly the nose of the plane is tilted upwardly; when the stick is tilted to the left the plane is tilted to the left; and when the stick is tilted fo the right the plane is tilted to the right. *This mode of operation is in consonance with the balancing movements of the pilot.*

As elsewhere indicated, human beings learn early in life to balance themselves on their feet and unconsciously lean in the opposite direction to any force which tends to unbalance them. The Court, of course, is aware of the fact that on a vessel rolling to the right, a passenger unconsciously and automatically leans to the left. This balancing instinct is quite as effective when sitting down as when standing. Note the leaning forward of a rider when his horse rears and the leaning forward of the occupant of a rocking-chair when it is tilted backward. The same is true of tilts in all directions; the person tilted invariably moves to maintain the vertical condition of his body.

The pilot of an airplane which is suddenly tilted in any direction tends to lean away from the lowest point of the plane and toward the highest point. In other words, he tends to keep his body upright or vertical. This tendency coincides precisely with the corrective movements of the joy-stick, which are necessary to compensate for a disturbed attitude of the plane.

Respondent has never contended that the joy-stick, because of this instinctive operation, enables a blind man to fly or permits a pilot entirely to forget the control of the machine.

Respondent has contended, and justly so, that the instinctive quality of the joy-stick in its best form is always of value to the pilot. This is so, first, because he does not have to make corrective movements to the right while he is instinctively leaning to the left, or forward while he is instinctively leaning backward. Second, because if the pilot maintains his hold upon the joy-stick, his instinctive movements, whether he thinks or not, carry the joy-stick with him and tend to right the plane rather than tend to unbalance it further.

Claim 8 of the patent in suit is for a combination having a mode of operation from which result these instinctive characteristics. The joy-stick could be produced without this distinctive mode of operation. It would still be vastly superior to any other equilibrium control. But the mode of operation covered by claim 8 supplies that last degree of

superiority which leaves nothing to be desired in the way of manual control.

Claim 7 is more functional in its character and is directed to operation of the joy-stick by reflex movements of the pilot. But claim 7, while somewhat functional in this respect, is patentable over the prior art in the same way that claim 5 is patentable. It contains the limitations of the single vertical universally mounted lever associated with the control organs which distinguish this invention from all others. Claim 7 is not necessary to the protection of this invention. It could have been cancelled from the patent without lessening the protection. We repeat, the instinctive operation follows from the combination of claim 8.

With this explanation much, if not all, of petitioner's argument falls by the wayside. The combination of claim 8 is a novel combination from any angle. Prior to respondent's invention there never had been a control of equilibrium of any kind, whether levers, handle-bars, wheels or otherwise, which was wholly instinctive in its characteristics. This is an important advantage of the particular structure of claim 8.

Petitioner states that the lever can be connected in various ways and argues that instinctiveness does not result from the control lever, but from the arrangements of linkages. It is not a universal lever that is protected by the claims. It is the combination between the control organs and the universal lever which comprises the invention, and the particular combination of claim 8 has the virtues above described.

Petitioner, hence, goes far afield when he calls this a process. It is a mechanism pure and simple, and it is a mechanism which has certain important advantages among which is its instinctive mode of operation.

Again, petitioner cites many cases which are not in the least in point.

Petitioner states that the instinctive character of the mechanism cannot be used to support the invention and that the operation of the control of claim 8 is not sufficient to constitute an invention. This is the first time that we have

heard seriously advanced the theory that if a mechanism is so constructed and operates that it saves life and limb by taking advantage of instinctive reactions it is not of sufficient importance to constitute invention. Perhaps if petitioner's counsel had to undergo the hazards of the army or navy pilot he would think it was of supreme importance to be able to control his ship, under the stress of combat, for instance, with as little thought as the instinctive character of the joy-stick permits.

In a note at the bottom of page 43 petitioner gives certain illustrations of what it calls non-instinctive or contra-instinctive control movements in sailboats and automobiles. But the various illustrations the petitioner gives refer to very simple movements in a single plane. The contra-instinctive movements of the tiller of a sailboat are due to an age-old design of rudder and tiller. In all automobiles the steering-wheel turns in the direction that the automobile turns. Such simple movements can be easily learned, but when it comes to the equilibrium of an airplane which demands, as we have shown at the beginning of this brief, an infinity of different movements with an infinity of different proportions of elevator and aileron control, and which also demands exceedingly quick thinking and manual action, and produces dire results if the thought or action is not quick and correct, instinctiveness is of great value.

If anyone before the respondent ever thought of an instinctive control, he must have discarded it for the reason that he agreed with petitioner's counsel in his idea of its value. The Court of Claims finds otherwise (Finding XII, Rec. p. 16).

But this significant fact still remains:

Not only the United States Government, but all airplane manufacturers in the United States and elsewhere, have been using the joy-stick control for twenty years, practically to the exclusion of all other controls. *In not a single instance has the government or the United States manufacturers used any other combination than the instinctive combination.*

According to petitioner's present stand, it was a matter of indifference what the mode of operation was. One mode

is just as good as another. If this were true, one would certainly look for a considerable diversity of modes of operation among our many manufacturers and the government itself. There has been none.

This is an excellent illustration of the remark of one of our prominent patent judges, to the effect that the defendant pays lip service to other constructions but the tribute of *imitation* to the patented device.

Evidently feeling that this was the fact, petitioner attacked the instinctive quality of the respondent's best form set forth in claim 8 by attempting to show that the patent itself illustrated and described instinctive and contra-instinctive controls and that the specification did not say which was preferred or refer specifically to the instinctive combination.

It is a fact that the specification does not specifically say that the construction of claim 8 is instinctive, or mention the advantages of the instinctive mode of operation.

But the construction from which instinctive operation flows has always been shown in the patent and described in detail. It is claimed in claims 7 and 8, and nothing more is necessary under the law.

Petitioner attempts to uphold its position by a statement that Fig. 7ª of the patent in suit shows opposite responses in longitudinal equilibrium. This would be entirely immaterial even if true, since respondent described and claimed the preferred responses in claim 8. On Rec. page 52, however, it is shown that Fig. 7ª was a mere draftsman's error in one of the group of views illustrating the bird-tail structure, the other views showing the instinctive responses of claim 8.

The petitioner complains that claim 8 was not introduced into the application until June 12, 1913, and that in the meantime the joy-stick had been adopted by the industry on a large scale. In passing, this adoption by the industry on a large scale consisted of a few planes imported by Bleriot and Farman and a few planes manufactured here (see Finding XXXVIII). But the application for the patent in suit always had shown and described the combination of

claim 8 and contained claims which included its construction and covered structures having all of the virtues of claim 8.

While the specification does not mention instinctiveness in so many words, it describes at great length the construction and mode of operation from which instinctiveness flows.

Permutit Company v. *Graver Corporation*, 284 U. S. 52, is obviously not in point. In that case, which related to a water filter, the claims were met by the prior art, as held by this Court. The plaintiff tried to induce this Court to read into the claims a certain chamber which was shown in the drawing, but not even mentioned in the specification or claims, and thereby to transmute invalid claims into valid claims. This would obviously have validated the claims by inclusion of a feature not described or claimed.

The opposite is true in the case at bar. The construction was adequately described and adequately shown from the beginning. All that was omitted was a statement that the construction had the advantage of instinctiveness.

When the patent issued, claims 7 and 8, which involve instinctiveness, were included in the patent. No better way is known to our law to point out the preferred construction than to claim it. Obviously *Permutit* v. *Graver* does not apply.

II.

The patent in suit should not be limited to the ring-tail and bird-tail constructions shown.

On page 47 of petitioner's brief under the title "The Patent, If Valid, Should Be Construed As Limited to a Combination Comprising a Pair of Vertical Control Levers with a Single Integral or Unitary Tail Surface of an Airplane," the petitioner argues that this should be done.

It would be sufficient to say that not the slightest reason is shown in the prior art or other defenses why such a complete emasculating of the patent should be done. On the contrary, there is every reason why it should not be.

1. None of the claims in suit is in any way limited as to the specific tail structures illustrated for inclining the plane around its major axes. Claim 2 provides for "distortable wings for maintaining transverse stability" and a "rudder (horizontal) for maintaining longitudinal stability." Any form of distortable wings (warping, ailerons, etc.) satisfies the first requirement, and any form of rudder (elevator, at the tail or elsewhere as in Wright's machine) satisfies the second.

Claims 5 and 9 require only some satisfactory means for producing lateral stability, and some satisfactory means for producing longitudinal stability. Doubtless such means should be airfoil surfaces adapted for increased or decreased incidence. No other has been found.

In both claim 2 and claims 5 to 9, the distortable wings and elevator are only parts of the combination, which includes the lever connected to both said means for operating them, and in claims 5 to 9 the lever must be a single vertical universally mounted lever.

2. Where is this device so described shown in the art?

Is it in Laroze? Laroze is a two-handed, two-minded structure, and even if operated by two hands, is hopelessly confusing for the intricate and delicate task it has to perform.

Is it respondent's 1906 structure? This structure, while not as hopeless as Laroze, still requires always the use of two hands for *equilibrium*. Let one lever go, and the plane goes into a spin at once, for all control of the longitudinal equilibrium vanishes. The construction and operation of the 1906 patent are fully discussed in the pages immediately following.

Is it in Wright? With the stomach cradle and the lateral equilibrium fixedly connected with the steering? And the elevator operated by a hand roll?*

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* The early Wright experiments demonstrating the possibility of heavier-than-air flight were epoch-making, but they were performed in the calmest possible weather. For several years after, in exhibition flights, no Wright pilot would take up a plane if there was air enough stirring to move a handkerchief. The Wrights themselves soon saw the impracticability of their control, and a number of years later developed a two-lever construction with a steering handle on top of the lateral control lever, such lateral control lever moving fore and aft and the steering handle swinging athwartships (Finding XXXIX, Rec. p. 33).

Is it in Macedo, Penaud and Gauchot or other of the prior art? These either lack complete equilibrium control or are essentially two-handed.

3. Which one of these imposes any limitations upon even the *broadest* of the claims in suit, let alone claim 8? Which is directed to the characteristic joy-stick responses?

The petitioner does not tell us.

Nor does the Court of Appeals.

Both deal in generalities. They say in view of the use of vertical levers in the art, it would not involve invention to, let us say, make the 1906 structure into the invention in suit. Let us see what this would produce.

a. We turn the horizontal levers of the 1906 structure into vertical levers, and immediately the equilibrium lever of 1906 becomes inoperative to produce any lateral control whatever. It is no longer a universally mounted lever; it is a simple lever which can turn on its own axis, and this turning would compel the turning of the wings for lateral control by twisting the equilibrium lever like a screw-driver—an obvious impossibility. This is admitted by petitioner's own expert (Rec. p. 59).

b. Somehow, however, we surmount this, and we still have *a two-handed control of equilibrium.*

c. In other words, one cannot take the two-handed 1906 structure and *combine it* with the other two-handed structures in the art and make a *one-handed structure.*

The truth is the invention in suit *had to be made,* the solution of the control problem *had to be found,* before any one could discover anything in the way of mechanism to effect it.

4. The petitioner proposes a formula for the 1906 structure, viz.: Move the end of the stick up to go *up;* move it

down to go *down;* move it to left to roll *left;* move it right to roll *right.*

Now this formula is not the joy-stick rule of action. That rule is "tilt the stick in the direction you wish the plane to tilt." The vertical arrangement of the joy-stick, combined with the ailerons and elevator, produces a combination in which the attitude of the plane is a *constant and dependable index or indicator* showing the direction the stick should be tilted for any of an infinity of attitude corrections. It is an equally reliable index or indicator for telling the pilot *just in what direction it should be tilted* to obtain a similar tilt of his plane for any maneuver.

These are totally absent from the 1906 structure. If the 1906 structure were one-handed, instead of two-handed, it would still be much inferior to the joy-stick structure, for the above reasons.

5. The petitioner states on page 49 of its brief that the general incidence control of the left-hand lever of the 1906 patent is not here in controversy. This general incidence control was a part of the 1906 disclosure and cannot be eliminated any more than the right-hand lever can be eliminated. The respondent evidently at that time thought the general control of the incidence of all four wings was necessary to make his machine, which was a tandem plane, take off, ascend and descend. He evidently believed that his right-hand control could not perform these operations. We cannot say he was wrong, for the plane was never flown.

What he *disclosed* by drawing and description required the constant use of two hands, and had little of the virtues of the joy-stick.

6. On page 50 of petitioner's brief the petitioner says that respondent did not solve the problem of equilibrium, although he endeavored to. If respondent had, he would be standing in the shoes of the Wrights as the first to fly. He never claimed he did.

Petitioner neglects to finish the lower Court's sentence, which was to the effect that respondent directed his attention to a "mechanism which would control the organs of an airplane * * * a mechanism as indispensable to the flight of a plane as the wing surfaces thereof."

From page 51 to page 59 petitioner's brief presents such a mass of misinformation with regard to the structures of the patent that we refer to the findings of fact, which are conclusive on the disclosure of the patent. These are Findings XIII, XIV and XV. They refute completely most of petitioner's statements.

In brief, however, we would state:

1. The ring-tail structure has the characteristic joy-stick responses which are standard all over the world.

2. The bird-tail has the same responses. Fig. 7ª, of all the views showing the bird-tail, contains a draftsman's error. Fig. 7ª is not a "modification," but merely a view of Fig. 10.

3. The tandem monoplane is a modification which is not described with particularity, the suggestion of the specification saying that one pair of wings may each be mounted and operated like the bird-tail. No mechanism for doing this is shown or described.

There is no statement in the specification of the patent in suit that this tandem plane may be operated by the "two horizontal levers of the 1906 French patent," petitioner's statement to the contrary notwithstanding.

4. There is no excuse for petitioner's statement that the drawings of the application were "shuffled in and out" in a kaleidoscopic or in any other manner. New drawings were filed when required by the Patent Office.

5. There is no validity in petitioner's statements that with the bird-tail the steering is reversed as the bird-tail passes neutral. The bird-tail is a cambered surface, always forming a part of the lifting surface of the plane (see Finding XIII, Rec. p. 17).

It never passes the neutral point. It is an elevator which acts to nose the plane up or down, by bearing less or more of the load—a common expedient. The steering lever never reverses its responses.

6. On pages 56 and 57 of petitioner's brief, the petitioner has for the first time acknowledged that the levers of the 1906 patent are interdependent, and not independent. This is in accordance with Finding IV (Rec. pp. 7-8). It proves conclusively that the 1906 patent has a two-handed equilibrium control, and that the shifting of the levers to a vertical position, if it could be done, would still leave it a *two-handed control.*

7. On pages 57 *et seq.* of petitioner's brief, petitioner refers to cross-responses by which slight steering effects may arise from elevator action. The findings (Findings XIV to XVIII, Rec. pp. 19-21) expressly state that no material cross-responses are present, and that all of the controls function to produce the results set forth and claimed. We refer to this more in detail on pages 60-62.

Nothing in the disjointed, fragmentary, and often erroneous, statements in this section of petitioner's brief shows the slightest valid reason for limiting the claims in suit to the ring-tail and bird-tail constructions.

A curious situation arises in this connection: The Court of Appeals is sponsor for this limitation. But the Court *does not say to which of these two specific constructions* the patent should be limited. The Court of Appeals apparently meant both.

But any claim broad enough to include both these constructions would include all conventional planes. These latter differ from the ring-tail only in that the elevator and steering rudder are mounted directly on the fuselage in the conventional plane, instead of indirectly by means of a ring as with the ring-tail.

But the *bird-tail* dispenses with a steering rudder altogether and makes the elevator perform the steering function.

The conventional tail structure is, hence, in detail much

closer to the ring-tail *than is the bird-tail.* So a claim broad enough to cover the ring-tail and bird-tail could not fail to also include the conventional plane.

The ring-tail has three elements forming the tail structure, viz., the elevator, steering rudder and ring. The bird-tail has but one element, viz., the elevator. The conventional plane has two, viz., the elevator and steering rudder. A claim covering a three-element structure and a one-element structure should cover also a two-element structure.

III.

The joy-stick mechanism shows clear invention over respondent's 1906 French patent.

On page 60 of petitioner's brief, under the title "The Vertical Control Lever Did Not Constitute Invention Over the Structure Disclosed in the Respondent's 1906 French Patent," petitioner advances some arguments seeking to support this view.

We have discussed this question to a certain extent under the preceding heading. We will here take it up in more detail.

A comparison of the 1906 structure and the structure of the patent in suit yields the following results.

(1) The 1906 structure had a horizontal right-hand lever which is alleged to control both equilibriums. As a matter of fact, *it did not,* as any consideration of the structure will show. The Court of Claims correctly analyzes this in Finding IV (Rec. p. 8), when it states:

> "* * * As the forward ends of both the right and left-hand levers must operate as fulcrum points during certain control manipulations and the levers are thus interconnected, it is essential that the pilot must continuously keep hold of both levers."

This must be taken as a fact in this case, and it should end the contention raised on this point.

If the pilot lets go the left-hand lever, all control of longitudinal equilibrium is gone, since the pivoted wings are free to assume any position that the aerodynamic forces compel them to take. Since a large majority of equilibrium corrections have a longitudinal component, it follows as a matter of course that during the greatest part of the time proper corrections cannot be made.

Furthermore, and perhaps more important, any plane traveling at level keel and in perfect equilibrium will immediately go out of equilibrium and get beyond control if the longitudinal control is released. This is particularly true of the type of plane shown in the 1906 patent, wherein the pilot is holding the entire four wings in position by main force.

(2) When the pilot uses two hands for equilibrium, he must move one hand and set up an opposite stress with the other hand. That is to say: when he moves his right hand in the 1906 structure, the left hand must resist the movement of the right hand. That imposes some necessity, at least, of mental operation. Added to this is the fact that the opposition of the left hand must be combined very frequently with the definite movement of the left hand for steering. In other words, when all is said and done, the steering efforts of the left hand are mixed up with the equilibrium control in that they must be frequently performed simultaneously.

(3) The 1906 structure is entirely devoid of one of the most important features of the joy-stick structure. In the joy-stick structure the attitude of the plane during an unbalanced tilt, as we have shown in our opening statement, constitutes an unfailing index or indication of the point to which the joy-stick should be moved to correct that particular tilt. Even assuming that the 1906 structure was a real one-handed equilibrium structure, such an indication is entirely lacking. The pilot would be obliged to guess where to move the right-hand lever, even if it had sole control of equilibrium. With the joy-stick all the guess is taken out. Now, if the pilot had but a single, occasional, corrective

movement to perform, one might become sufficiently skilled with the 1906 structure to be able to make a fairly good guess. But the guessing is mental and calls for attention on the part of the pilot. When the actual conditions of flight are considered, however, and it is borne in mind that the necessity for one equilibrium correction follows another, sometimes in very rapid succession, the ability of the joy-stick to move directly from one indicated position to another indicated position is of great importance. As most of the corrections are compound, this importance is enhanced. In the 1906 structure the confusion in meeting these conditions would be very great.

(4) The 1906 structure, even if it were a one-handed structure, does not take advantage of the instinctive feature of the joy-stick. One might concede a certain amount of instinctiveness in the lateral control in the 1906 structure, but longitudinal controls are not instinctive. The right-hand lever being horizontal, it does not respond to the movement of the pilot's body for longitudinal control; if it did, the response would be contra-instinctive. The net result is very much the same as though a man on a rolling and pitching ship were required to lean in a natural way toward the high side of the ship when the latter rolled, but when the ship pitched, he did not lean at all, or leaned toward the low end.

(5) We have previously alluded to the formula invented by petitioner's counsel, that with the 1906 patent one pulls up on the lever to go up, pushes down on it to go down, pushes it to the right to roll to the right, and pushes it to the left to roll to the left. There are several objections to this formula. Going up and down are *altitude* maneuvers; rolling right and left are *attitude* maneuvers. It would be frequently necessary, if the 1906 structure were actually flown, to pull up on the lever—not when the plane was intended to go up, but was intended to go down less acutely, as in landing. The same thing occurs in ascending.

With the joy-stick, the position of the stick has to do not with the altitude, but with the angular attitude of the ship.

Can the Court imagine an airplane having a large handle immovably fixed to the latter in a perpendicular position, and a giant hand grasping the handle, and always accompanying the plane and capable of moving the entire plane by the handle? And then visualize the handle being moved to restore the plane to balance whenever it departs therefrom, or to tilt the plane bodily in whatever direction the pilot wishes for any maneuver? If so, the Court will obtain a fairly good idea of the operation of the joy-stick. The pilot does the same things in substance when he uses the joy-stick.

(6) In the 1906 structure—assuming that it was a true one-handed control—when the pilot wished to make a maneuver, the method of operation by which he can make the desired inclination of his machine is not nearly so simple as with the joy-stick structure. In the joy-stick structure the pilot simply moves the stick directly toward that part of the plane which he wishes to lower; let us say, in making a bank, or a diving bank, or any other maneuver. If he has miscalculated the angle, a slight shift of the joy-stick toward the proper point is simplicity itself. With a horizontal lever the orbit of movement of the handle end bears no direct resemblance to that part of the ship which the pilot desires to lower or toward that point which the pilot desires to incline. As before stated, with the joy-stick the pilot does not have to lay out any particular proportion of longitudinal and lateral tilt to obtain a desired maneuver. The joy-stick mechanism does this for him. The rule that one tilts the joy-stick in the way that the plane is desired to be tilted is sufficient, and this in turn becomes highly automatic.

This is, of course, as before stated, even more true in the corrective movements of the stick.

(7) A final proof of the inventive superiority of the joy-stick is that any industry is best judge of the efficiency of its mechanisms. Many years ago the airplane industry unerringly and practically unanimously selected the joy-stick as the control which it desired to use. It will have no

other to-day, wherever the plane is not so excessively heavy and large that it requires more power than the unaided strength of the pilot can give. In the United States, at least, the 1906 mechanism was open to free use; the joy-stick mechanism was not. No one ever used the 1906 mechanism; everyone has used the joy-stick mechanism. This was not due to advertising, pushing, or to any other reason except sheer merit.

Whatever may be said of petitioner's made-up formula for the 1906 structure, it is certainly not the formula of operation for the joy-stick structure. The industry is unanimous in adopting the joy-stick formula and unanimous in rejecting the 1906 formula.

(8) The Court of Claims said (Rec. p. 59):

> "* * * plaintiff's scientific knowledge immediately disclosed to him the fatal defects in his first French patent [that of 1906], and he promptly abandoned it. No such device was ever constructed, and, almost immediately following, the vertical lever mechanism came into existence. * * *"

The petitioner criticizes this on the ground that this 1906 structure was included in the first application papers which arrived too late in this country. We have discussed this on page 25. It did have fatal defects from the standpoint of operation; but from the standpoint of what it disclosed, looking toward a proper control, any attorney would have included it for what it was worth in the application which was originally prepared for the United States.

Had this been filed within the year, *it would at least have completely neutralized the long and vigorous contentions of the petitioner which we are now discussing.*

But this unsuccessful attempt by respondent to include the 1906 structure in the present application in no way disturbs the *facts* upon which the invention of the joy-stick mechanism are clearly founded. It does not make the 1906 structure any other than a two-handed control; it does not make that structure a simple, direct, self-indicating control;

it does not make that structure take advantage of the instinctive balancing movements of the pilot. These are facts. The petitioner's remarks are arguments, without foundation.

(9) On page 63 the petitioner reiterates that it was not invention to change the levers from the horizontal to the vertical. When so distinguished an expert as Mr. Arthur S. Browne states that this could not be done while still retaining lateral control, this has more probative effect than the arguments of counsel (Rec. p. 59).

(10) In a footnote at the bottom of page 63 the petitioner relies on *Atlantic Works* v. *Brady*, 107 U. S. 192, 199-200, quoting extensively from that decision. In that case all of the elements were old and the combination accomplished no new result. It amounted merely to supplying a boat with a front screw where the rear screws had been used for the same purpose.

The petitioner has persistently avoided any discussion of the actual facts of the art here under consideration. As found by the lower Court (Finding XXXIX, R. p. 33), up to 1912 the two standard airplane controls were the second Wright control and the Curtiss control. Neither of these was prior to the invention of the patent in suit. They represented the best that the most prominent experts in the art in the United States could produce. They were nothing like the joy-stick mechanism, and they were promptly discarded when the virtues of the joy-stick became apparent to the United States at its entry into the war. The conclusion is irresistible that the United States, for its army and navy, demanded the best and found that it did not have it.

We call attention to the testimony of General Foulois (petitioner's witness) on this point (Rec. p. 51).

This was not a trifling device, a shadow of an idea, which would naturally and spontaneously occur to any skilled mechanic. It did not naturally or spontaneously occur to the two acknowledged masters of the art, or to any others. Instead of being a trifling improvement, it is of supreme importance in the art of aviation, and has greatly increased the safety of flying.

IV.

Disclosure supports claims in suit.

On page 66 of petitioner's brief, under the heading "The Claims of the Patent in Suit Are Not Supported by the Disclosure," the petitioner argues that the construction shown and described does not support the claims in suit. Petitioner makes statements which are absolutely contrary to the findings. The contention of petitioner, which is quite exploded in this case, is based upon the assumption that it is necessary in respondent's structures to operate both the joy-stick and the steering lever in order to obtain equilibrium control. This in turn is based upon the theory that there are so-called "cross-responses," and upon this theory alone. The cross-response complained of is a variation in steering when the elevator is used and a variation in pitch when the steering lever is used. This theory was foisted bodily on Judge Campbell and the Court of Appeals.

Cross-responses are ascribed to the ring-tail structure shown in the patent by reason of a slight pendulous movement, due to the ball-and-socket mounting, and having an amplitude of only about 7 degrees to each side of the vertical. Such pendulous movement is not referred to in the patent: is no part of the patented structure; is restrained by the connections shown in the patent, so that it does not occur in practice, and, if it did occur, could be restrained by the simplest sort of a guide, since it forms no part of the operative parts and does not enter into the operation of the device (Finding XV, R. p. 19).

It is an indication of the flimsy character of the defense in this case that petitioner has made so much of it, even going to the extent of misdescribing the patented control throughout its brief as a two-handed control.

To show that such a cross-response did not exist in any appreciable measure, respondent built a ring-tail structure and successfully flew, at Amityville, Long Island, N. Y., an "Aeronca" plane with such ring-tail structure substituted for

the usual tail structure. In constructing this ring-tail structure respondent made it with *twice* the needless pendulous movement shown in the patent. The testimony was that if there was any cross-response, it was not noticeable to the pilot and that the control lever and steering lever operated independently of each other, each to secure its intended result.

The petitioner in this case went to the extraordinary lengths of fitting out two full-sized planes and testing them in wind tunnels. These tests proved exactly nothing.

The Court of Claims' findings in this matter are contained in Findings XIV, XV, XVI and XVII (Rec. pp. 19-21). We quote from Finding XV:

> "* * * Irrespective of the cross responses, the pilot may use the left-hand lever to steer the airplane to the right or left and use the right-hand lever to effect a change in either the pitch or transverse attitude of the airplane" (p. 20).

We quote from Finding XIV:

> "* * * The presence of such cross-response in this second modification [bird-tail], illustrated and described in the patent in suit, does not impair the operativeness of either of the right or left-hand levers and each lever performs its function regardless of the position of the other lever" (p. 19).

We quote from Finding XVII, referring to the Amityville flights with the "Aeronca" plane:

> "* * * In all flights the steering and stabilizing levers were mechanically separate and independent and each lever performed its own function regardless of the manipulation of the other lever" (p. 21).

This whole defense is particularly disingenuous, since every tyro in the art of flying knows that all airplanes have minor cross-responses in normal use. This is due to the extremely sensitive condition of an airplane when it is aloft. Changing any one airfoil surface tends to involve a change in the attitude of the plane not accounted for by the changed surface.

The Court of Claims, in Finding XVIII, refers to these cross-responses in all airplanes. If the Court will read the basic Wright patent, No. 821,393, it will see that Wright's whole theory of flight was concerned with the offsetting of errors in steering which came from using the transverse equilibrium control. To neutralize this Wright connected up his transverse equilibrium control with his steering rudder so that such errors would not occur. While this undoubtedly aided the Wrights in their first flight, they speedily disconnected the steering rudder and warping wings, and from that day to this such connected rudder and wings have never been used.

Respondent did not repeal the laws of aerodynamics when he produced the joy-stick mechanism. Airplanes still have cross-responses of various kinds, and it is a part of the duty of the pilot to correct them with the proper organ. It simply constitutes another call on the pilot's attention and increases the desirability for a control which can instantaneously and certainly make proper corrections.

Respondent was not dealing with cross-responses at all. He was dealing with a control system.

Whatever excuse the record in the *Chance Vought* case may have afforded the District Court and the Court of Appeals for accepting the defendant's preposterous theory, the record in the case at bar completely forecloses this defense. It never had any merit, and the Court of Claims goes out of its way in its findings to completely scotch it.

V.

The patent is not invalid on the ground that the claims in suit were not inserted in the application until 5½ years after filing, while the device came into general use prior to that date.

This is discussed on page 68 of petitioner's brief.

It raises one of the three questions of law which are presented for review.

The *facts* stated by the petitioner are either erroneous or inconsequential, and consequently its law is misapplied.

The original application for the patent in suit was prepared in France, where the rule is that the claims do not limit the invention but are merely a recital of various parts. The application contained the following claims:

> "4. An aeroplane in which the controlling is effected by two separate levers, rigid transmissions for controlling the distortable wings and both rudders."
>
> "6. An aeroplane in which the controlling methods of the rear tail forming the rudder is carried into effect by means of two levers symmetrically arranged with reference to the pilot seat, the left-hand lever, for example, causing through a cardan system the rotation of the rudder about a longitudinal horizontal axis, and the moving of the right-hand lever causing the inclination thereof about a transverse horizontal axis."

Doubtless these claims are informal according to the American practice. But, equally doubtless, they gave notice of the invention which was to be claimed.

The application was filed on January 16, 1908. The Examiner on March 10, 1908, required a new specification in grammatical and idiomatic English; he also required new drawings, because the drawings in the case were diagrammatic. The claims were objected to as being functional.

On February 1, 1909, respondent filed an amendment in which he presented a new specification in idiomatic English and new drawings and a new set of claims. This specification conformed to the original showing, and petitioner carefully refrains from stating that it did not.

It is insulting to anyone's intelligence to state that "this was a lawyer's contrivance." No new oath was required by the Patent Office, and none was filed (Finding X, Rec. p. 13). If there had been anything calling for the filing of a new oath one would have been required by the Patent Office.

The claims inserted by this amendment of February 1, 1909, involved nothing new over the original showing.

By this amendment of February 1, 1909, the claims, as well as the specification, were presented in formal shape in response to the Examiner's requirement. One of these claims, presented as claim 7, was *immediately allowed* by the Patent Office, remained continuously in the application until the date of issue, and is now claim 2 of the patent in suit, being one of the claims in issue.

This claim is as follows:

> "2. An aeroplane having distortable wings for maintaining transverse stability, a rudder for maintaining longitudinal stability, a lever controlling said wings and said rudder, a steering rudder, and a separate lever controlling said steering rudder."

This claim was renumbered claim 6 by the next amendment (File Wrapper, p. 34). It was again numbered 7 by the third amendment (File Wrapper, p. 37). It was again allowed by Office action of May 10, 1910 (File Wrapper, p. 46). Its number was changed to 3 by the fifth amendment (File Wrapper, p. 49). It was again allowed on May 27, 1911 (File Wrapper, p. 52). It was subsequently numbered 2, as it appears in the patent (File Wrapper, p. 61).

This claim covers each and every one of the petitioner's structures in issue and every modern plane having a single equilibrium control lever. The term "distortable wings" is a generic term. There is no dispute about that in this case. In respondent's device the wings were distorted by warping them. In more modern planes the wings are distorted by warping only a portion of them, which is hinged to facilitate the warping and, as before stated, is known as ailerons.

Petitioner's planes and all modern planes using the joy-stick control have distortable wings for maintaining transverse stability, a rudder for maintaining longitudinal stability (elevator), a lever controlling said wings and said rudder (joy-stick), a steering rudder, and a separate lever (usually a foot lever) controlling said steering rudder.

The presence of this claim in the application for the patent in suit from February 1, 1909, down to the issue of the patent, completely disposes of any question of laches or intervening rights.

There were no joy-stick airplanes in this country, in public use or otherwise, when present claim 2 was introduced into the application on February 1, 1909. This is clearly set forth in Finding XXXVIII and must be accepted as a fact in the case.

The same amendment of February 1, 1909, introduced two claims, originally numbered 12 and 13 (File Wrapper, p. 27).

Claim 13 is as follows:

> "13. An aeroplane having means for controlling its inclination and a single lever for operating said means to control both the longitudinal and the transverse stability of the apparatus; said lever being arranged to oscillate in different vertical planes, means for transmitting its movement in one plane to the means for governing the longitudinal inclination, and means for transmitting its movement in the other plane to the means for determining the transverse stability, said lever being mounted to permit also an oblique movement having components in each of said planes so as to actuate simultaneously the means for establishing longitudinal stability and that for establishing transverse stability."

This claim also covered every plane ever used by petitioner or anyone else having a single lever control of both ailerons and elevator.

Petitioner not only admits this, but goes further, and says that claim 13 was *broader* than the claims in suit (see Petitioner's Brief, p. 76). That is, for the purpose of this "*intervening rights*" argument, no claim had been presented in the application for 5½ years after its filing date, which would cover petitioner's planes. For the purpose of its "estoppel in the Patent Office" defense, claim 13 is said to be so broad as to cover petitioner's planes, and, since this claim was erased after rejection, the claims in suit must be so narrow that they *do not* cover petitioner's planes.

The petitioner should make up its mind *which* is right.

The *fact* is that claims 12 and 13 of the amendment of February 1, 1909, were substantially identical with claims 5 to 9 in suit, and differed only in terminology.

Claims 12 and 13 were erased from the application on May 23, 1912. The claims in suit were made on June 12, 1913—about thirteen months later.

Quite aside from the continued existence of claim 2 in the application from February 1, 1909, down to and including the issuance of the patent, the Court will note that the application *was never without claims of the scope of the claims in suit for a period of more than thirteen months.*

Consequently, if there had been all the public use in the United States which the petitioner could wish, there was no period of two years when the application was without claims which would cover the machines so used in public.

But, as a matter of fact, as shown in Finding XXXVIII (Rec. p. 32), the Bleriot and Farman planes brought to this country and the planes said to have been built here involving the joy-stick, were not here at any time when there was an absence from the application for the patent in suit of claims 12 and 13 or their successors, claims 5 to 9 of the patent in suit.

Under the doctrine of *Chapman* v. *Wintroath*, 252 U. S. 126; *Westinghouse* v. *Jeffrey De Witt*, 22 Fed. (2d) 277-279, and *Jones* v. *Freed-Eisemann*, 47 Fed. (2d) 174-177—which is the only doctrine that could have any bearing in a case like the present—this Court and others have specifically held that there must be a period of two years' activity by a third party *before* claims were presented in a division, or inserted in an application, in order to constitute laches or be subject to intervening rights. There was no period of two years anywhere in this case that the application did not contain a claim or claims amply covering the joy-stick mechanism. It was covered by claim 2 from February 1, 1909, on, and by claims of the type of claims 12 and 13 from February 1, 1909, down to the date of the patent with the exception of an interval of thirteen months. There can be no laches or intervening rights under these circumstances.

The decisions to which the petitioner has referred, therefore, do not apply. Strictly *new matter* which was never founded in the original application cannot be introduced at any time. As to matter which was founded in the application but which was not originally claimed, this may be claimed at any time within two years after someone else enters the field.

In view of the foregoing, petitioner's allusions to a five and a half year period in the present application are purely imaginary. It does not exist in this case.

VI.

Respondent did not acquiesce in the rejection of claim 13 and is not now estopped from asserting that the claims of the patent in suit should be construed to cover the vertical control lever.

Under a similar heading, on page 76, petitioner in its brief urges its theory of estoppel, this being the second of the three questions of law raised by the petition.

Whereas, under the preceding heading, petitioner is satisfied that claim 13 is too narrow to cover petitioner's planes —and that no claim broad enough to cover them was introduced until five and a half years after the filing date— petitioner now urges that claim 13 was in fact a *broad claim* —so broad that it covered the joy-stick mechanism when used for maneuvers. Claims 2 and 5 to 9 of the patent now become so narrow that they cannot be interpreted broadly enough to cover petitioner's planes because of the estoppel arising from the erasure of claim 13 in the Patent Office.

What is the real fact?

As we have before indicated, claims 12 and 13 of the amendment of February 1, 1909, were substantially the same claims as claims 2 and 5 to 9 of the patent in suit.

There can be no estoppel under these circumstances. This is made clear by the decision of this Court in *Overland* v. *Packard,* 247 U. S. 417—wherein it was held that the Patent

Office has a right to give reconsideration to claims of the same scope as those which have been erased and that, if it allows such claims, nobody can complain.

This is the regular practice in the Patent Office, since during the prosecution of an application much more light is thrown upon the invention and the prior art, and the Patent Office often sees that it is in error and, naturally, corrects it.

We shall show later than even if claims 2 and 5 to 9 were mistakenly limited to the use of the joy-stick mechanism solely for equilibrium purposes, there would be clear infringement by the petitioner's planes, and the lower Court has so held.

We now propose to show that the claims in suit should not be so limited and that they are substantially the same in scope as claims 12 and 13 of the amendment of February 1, 1909.

In the Claims in Suit Respondent Used the Common Terminology of the Art. In the early days at the time of respondent's invention, airplanes were very difficult to fly and, as stated by the Wright brothers, the main trouble was in obtaining equilibrium. Of course, any plane which flew had to take off from the ground and return to the ground, for w' ch purpose it required an elevator. It had to bank in making turns, for which purpose it required distortable wings. But these two operations were comparatively seldom performed, as contrasted with the ever-present necessity of maintaining equilibrium. The ailerons and elevator, therefore—while they were always used for ascending, descending and banking—became known in the art by their principal use; they were called equilibrium organs, stabilizing organs or balancing organs—all of which terms were in common use. A plane was said to be in stable condition when it was balanced. It was also said to be in equilibrium. The respondent in his patent might have used the phrase, "means for producing balance" or "means for producing equilibrium." He chose the phrase "means for producing * * * stability." He might also have used the term "means

for controlling the attitude of the plane," but this phrase was not as commonly used as any of the others above quoted.

No matter which phrase he used, he would have been understood thereby to have meant a broad term for the two organs in question—namely, distortable wings and elevator. No one would have questioned at the time of respondent's application that these terms included the use of the organs for ascending, descending or balancing, as well as stabilizing.

These Organs Do Not Have Two Functions. Petitioner proceeds on the theory that the ailerons and elevator have one function when they are balancing or stabilizing, and another function during maneuvers. This is entirely erroneous. They have each but a single function, and that function is the turning or inclining of the airplane around an appropriate axis. The distortable wings always turn the airplane around the longitudinal axis, and the elevator always turns it around the transverse axis. They do this in precisely the same way, irrespective of the purpose which the pilot has in mind when he operates them. He may, and usually does, operate them at one instant to bring his plane back to balance, while at the next instant he uses them in exactly the same way to incline the plane in precisely the same manner when he wants to change the attitude of the plane for a premeditated maneuver. In other words, the phrase "means for maneuvering an airplane"—so far as it relates to the *attitude* of the plane—means exactly the same thing as "means for stabilizing an airplane."

Illustration of the Lack of Distinction Between Maneuvering and Balancing. A simple example will illustrate the truth of what we have just said.

An airplane, let us say, is proceeding at level flight and, just as the pilot is about to make a turn and bank, the left wing is depressed by a gust. The pilot, *to restore his stable attitude,* moves the joy-stick to the right; the plane then turns on its longitudinal axis until the left wing is level again. The pilot, now having regained control, proceeds to turn to the right. To effect this *maneuver,* he banks the

plane to the right. It is done by the pilot's holding the joy-stick in precisely the same position that he had it for the balancing operation; that is, in its inclined position to the right, and the plane having been levelled by the restoring movement, the left wing continues to rise for the bank.

Now, in this very ordinary occurrence, the pilot has done nothing whatever to the joy-stick or the ailerons except hold them in place; and yet, according to petitioner's theory (in which, of course, it is mistaken), when the pilot first moved the stick to the right, he was infringing the patent because he was producing stability; when he held the stick to the right for the bank, he was not infringing the patent because he was producing a maneuver.

Patents are not granted for this sort of thing. They are granted for mechanisms. On petitioner's theory the patent would depend on the pilot's intention.

There Is Nothing in the Specification or in the Prior Art of the Patent in Suit Which Imposes Any Such Limitation. The file wrapper may be searched in vain, the prior art cited by the Patent Office may be searched in vain, and the defenses set up by the petitioner may be searched in vain for anything which would impose the limitation which the petitioner wishes, namely, that the claims in suit are limited to purely stabilizing movements. The same organs were used throughout the art for both purposes and it was merely a matter of what they were called. Sometimes they were called stabilizing means, other times equilibrium means, and other times balancing means or means controlling the attitude of the plane. The specification of the patent in suit makes no such distinction as is desired by petitioner.

The Court of Claims in its *Findings* establishes the fact that even if the claims are so limited they are still infringed by petitioner's airplanes, since petitioner's airplanes, in fact, use the joy-stick combination for stabilizing or balancing purposes.

Throughout the Findings, however, it will be seen that the Court includes in this term the use of the same mechanism for maneuvering.

Claim 13 was of substantially the same scope as the claims in suit. Claim 13 uses the terms "means for controlling its inclination," "control both the longitudinal and transverse stability," "establishing longitudinal stability," "establishing transverse stability," "governing the longitudinal inclination" and "determining the transverse stability." These varied terms are simply an assortment of names meaning the same thing. In claims 5, 6 and 9 in suit the single phrase is used, "means for producing * * * stability." The scope of the claims is substantially the same as that of claim 13.

This is illustrated by claim 8 in suit. This claim first recites substantially the combination of claim 5 and then proceeds to give the specific preferred responses. The operation is said to be to "direct the airplane downwardly," "to elevate the airplane," "to raise the airplane on the left and right, respectively." These phrases are not limited to equilibrium movements. They include both equilibrium movements and control movements. This claim, hence, very aptly illustrates what we have said, that the terms "means for producing lateral stability" and "means for producing longitudinal stability" refer to the organs themselves. There is no need in claims 5 and 6, for instance, to further identify them. In claim 8, however, it is necessary to more specifically describe them. This claim, hence, sets forth what the means for producing stability do when operated. They direct the airplane either downwardly or elevate it. They raise the airplane either on the left or the right. As before stated, such changes in attitude are for any purpose, whether to control for stabilization or to control for maneuvers.

VII.

Petitioner's contention that Esnault-Pelterie was not the inventor of the airplane control lever is clearly wrong.

On page 79 of its brief petitioner makes a so-called argument which is a tissue of misstatements. The true facts are these:

Respondent signed an agreement with Bleriot which had nothing whatever to do with the inventorship of anything, much less the joy-stick invention.

Bleriot had used a certain control shown in the so-called Vautrin sketch, forming a part of Finding XLIII (reproduced at page 42a, Binder). This control was an *elevator and a steering rudder* operated by one lever. At that time respondent believed he was the inventor of the broad idea of any controls mounted universally, by reason of his 1906 patent. (He was not, in fact, since an elevator and steering rudder lever had been known years before.)

The contract provided that Bleriot was in "prior legitimate and personal possession" of an invention carefully defined, viz.:

"A single lever mounted on a cardan joint."

This did not even define what the single lever did. Much less did it describe the joy-stick mechanism.

The phrase "prior legitimate and personal possession" means under the French law prior to the *application for patent*. It does not mean prior *inventorship* at all.

The Bleriot use probably interfered with the monopoly in *France* of the broad idea of a lever with a cardan joint, and hence the agreement.

It is perfectly obvious that (1) it was not the joy-stick mechanism about which respondent and Bleriot were contracting; and (2) there never was an admission of use prior to any *invention* of respondent, but only prior to the French application.

Finding XLVI completely disposes of this alleged defense. Neither the Court of Claims nor the Court of Appeals gave it any weight whatever.

And yet the petitioner persists in saying many times that respondent solemnly admitted that Bleriot was the actual inventor of the joy-stick mechanism, and that respondent was not.

Petitioner winds up its fantastic argument by saying that at least the invention of *claim 2* was admitted to be Bleriot's.

It was nothing of the sort, and counsel well know it. Claim 2 does not cover "a single lever mounted on a cardan joint." It covers a mechanism in which an elevator or the like and distortable wings are controlled by a single lever, and in which a steering rudder is controlled by a separate lever.

In the Bleriot construction the *elevator and steering rudder* are *controlled* by a single lever—a construction which is immeasurably inferior to the joy-stick mechanism, and which Bleriot abandoned in favor of the joy-stick construction.

Petitioner's remarks about disclaimers, oaths, unreasonable delay, etc., in connection with the Bleriot matter are entirely meaningless.

Ferber. Ferber published two books relating to aeronautics, one in 1904 and one in 1906. Neither contains the slightest suggestion of the joy-stick.

Petitioner took the evidence of several Frenchmen (Peyret, Burdin, Niepce, Lacan, David and Didillon) as to Ferber's work in France. The Court of Claims refused to consider this use in France as a defense under Section 4923, R. S., which expressly rules out such evidence. It has been a principle of our law for about 100 years that a use abroad is no defense against a United States patent.

This is now embodied in Section 4923, R. S. (U. S. Code, Title 35, Sec. 72), which is as follows:

> "Whenever it appears that a patentee, at the time of making his application for the patent, believed himself to be the original and first inventor or discoverer of the thing patented, the same shall not be held to be void on account of the invention or discovery, or any part thereof, having been known or used in a foreign country, before his invention or discovery thereof, if it had not been patented or described in a printed publication."

In a footnote on page 84 of its brief, the petitioner suggests that this Court should, in effect, amend the statute so that Ferber's work in France may be used as a defense in this case. Petitioner states that it is "highly doubtful"

whether it could be said to be within the intendment of the statute that prior use in a foreign country should not bar the issuance of a patent to a citizen of the same country as that in which the use took place.

The provisions of Section 4923 constitute one of the oldest principles in the American patent law, and we take it that this Court will not deliberately amend this section as suggested. The section applied to any patentee, whether a citizen or an alien. It has its foundation on Section 7 of the Patent Act of 1836, which provides that a patent shall be allowed—

> "* * * if * * * it shall not appear to the Commissioner that the same had been invented or discovered by any other person *in this country* prior to the alleged invention or discovery thereof by the applicant, or that it had been patented or described in any printed publication in this or *any foreign country.* * * *" (Italics ours.)

In the general revision of the patent statutes, approved June 22, 1874, Section 4886, R. S., provided that any person who had invented a device—

> "* * * not known or used by others *in this country,* and not patented or described in any printed publication in this or *any foreign country,* before his invention or discovery thereof * * *" (Italics ours.)

might obtain a patent.

As we see no possibility that this Court will change this ancient provision of our statutes by judicial legislation, we will refrain from arguing this point further.

Even if this use had been in the United States, the proof is quite insufficient to establish the defense of a prior public use (see Finding XLI). The Court of Claims has held as facts that the Ferber planes were experimental; that none is in existence; that no contemporaneous photographs or drawings are in existence. The proof consists entirely of the recollections of the French witnesses taken twenty-five years after the event. The so-called "focs" or jibs of Ferber

started as *steering* devices (Finding XL, Rec. pp. 33-34), and never lost that characteristic function. If we may believe the witnesses, no Ferber plane had steering means separate and distinct from lateral equilibrium controlling means (Finding XLI, Rec. p. 34); in fact, they were the same "focs." Hence, the planes would not laterally balance unless they steered, and *vice versa.*

Proof such as this would not make out a case of anticipating public use in the United States.

Captain Ferber was an officer of the French Army, experimenting for the French Government. Notwithstanding Ferber's work, respondent sued the French Government for infringement of his French patents and recovered in full. If Ferber had had a real joy-stick control, this could not have happened, since the French Government would have been immune under the "prior legitimate and personal possession" rule in France, discussed with regard to the Bleriot defense.

Petitioner's allegation that Section 4923 should be amended constitutes the third of the three questions of law raised by the petitioner in its petition.

VIII.

Infringement.

The patent in suit is clearly infringed.

On page 85 of petitioner's brief, under the heading "The Patent in Suit Has Not Been Infringed by the Petitioner," the question of infringement is discussed.

The petitioner finds itself with airplanes having precisely the same general mechanism as the patent in suit. Each of petitioner's airplanes has ailerons, an elevator, and a single vertical lever movable in all directions for controlling the ailerons and elevator, just as in the patentee's ring-tail structure, for instance. The combination is such that upon

a forward movement of the vertical lever, the airplane noses down; upon a rearward movement, it noses up; upon a movement to the right, it rolls to the right, and upon a movement to the left, it rolls to the left. It thus has all of the elements of even claim 8, which covers the most complete joy-stick construction and operation. The remaining claims are, of course, clearly infringed.

When a defendant in a patent suit has a construction which contains the *entire mechanism of the patent in suit, operating in the same way,* such a defendant has a heavy burden to show that he does not infringe.

In the *Chance Vought* suit the same conditions prevailed, and there was foisted upon the District Court and the Circuit Court of Appeals what cannot be otherwise described than a hoax.

Being successful before the Court of Appeals, it was again tried in the present case. The Court of Claims—possibly assisted by much more complete evidence—saw through the petitioner's contentions, and both in the findings and in the opinion, completely discarded it.

This hoax was that the petitioner's planes were so stable as never to require ailerons or elevator to balance the plane for bringing it into equilibrium. The assertion was made that petitioner's planes were so stable as to fly themselves. Of course, since the petitioner's planes had ailerons, elevator and joy-stick, some excuse was needed to give a reason why these devices were present. The excuse supplied in the *Chance Vought* suit and copied in this suit is that the ailerons, elevator and joy-stick are only used to *overcome* the automatic stability of the plane (Pet. Brief, p. 91) for a maneuver; or, in other words, to "*destabilize*" the machine for an evolution (Pet. Brief, p. 93). With this the Circuit Court of Appeals agreed on the record before it.

This contention in the case at bar is not presented for review since the Court of Claims has found to the contrary as a fact.

Finding XXI, pages 22-23, clearly states that in the three infringing planes:

> *"The means for controlling the transverse and longitudinal equilibrium,* or pitch and roll, of the airplane comprises a vertical lever known as the 'joy-stick,' universally mounted at its lower end in position in front of the pilot so that its upper end may be conveniently grasped with either hand * * *. Through an arrangement of pulleys and cables the effect of the movement of the lever to the right causes a variance in the angle of attack of a hinged portion of the winged surfaces so that the right wing as a whole drops and the left wing rises, the machine therefore rolling to the right. * * *" (Italics ours.)

The finding then states that:

> "The 'joy-stick' or vertical lever is connected with the horizontal control surfaces at the rear or tail of the airplane, which controls *its longitudinal equilibrium* in such a manner that when this lever is pushed forward the control surfaces are so manipulated as to cause a downward movement of the rear edge of the elevator surface, which in turn results in the downward inclination of the machine. * * *" (Italics ours.)

The finding then states that a movement of the lever to the rear causes a nose-up position, and that when the joy-stick is moved in any intermediate position a consequent movement of the airplane will be produced corresponding relatively to the degree of inclination and to the direction of movement of the lever.

Finding XXII (Rec. p. 24) reiterates that the joy-stick system controls the *lateral and longitudinal equilibrium* of the petitioner's plane and that the airplane is caused to tilt with the stick in a way to *accord with the instinctive balancing sensations of the pilot.* This finding also states that the rudder bar functions as a separate lever for controlling the steering.

The same finding states as follows (Rec. p. 25):

> "*The equilibrium control lever or joy-stick of the three airplanes has the same controlling functions as the equilibrium control lever of the patent in suit.*" (Italics ours.)

The Court is asked to note that the finding, in as plain English as could be wished, thus holds that the infringing machines are constructed and operate exactly as in the patent, barring unsubstantial changes.

It is therefore submitted that it is not now open for argument that infringement is present. The Court of Claims has found that the joy-stick in the infringing planes is constructed and operates as an equilibrium lever, that it controls the inclination of the plane. Further, it is established as a *fact* that this joy-stick combination is used for *equilibrium control.* This completely throws out the petitioner's contention that its planes are so stable as *not to require the use of the joy-stick for equilibrium purposes at all.* Infringement is therefore inevitable.

Further, in the opinion of the Court of Claims (Rec. p. 73) the Court gives short shrift to this contention of the petitioner.

The Court begins with the following statement:

> "The terminology of the claims in suit is found to apply to the Government structures word for word and element by element."

It continues with cogent reasons why the petitioner's contention is wrong and ends on page 74 of the record with the following statement:

> "The three alleged infringing planes of the Government all possess the single vertical lever movable in every direction for controlling the lateral or longitudinal equilibrium of the plane connected to controlling surfaces having the same functional effects as those disclosed in the patent, and the Government cannot escape infringement on the rather remarkable theory that the Government planes fly themselves."

The underlying reasons for these positive findings and opinion of the Court of Claims on the question of infringement are as follows:

Inherent Stability. The alleged inherent stability of the Government planes is due to the arrangement of the wings so that they together make a dihedral angle or very flat V shape. The wings have also a slight sweepback. Whatever transverse stability the Government planes had is due to this structure. Whatever longitudinal stability they had is due to a similar dihedral angle between the wings taken as a group and a fixed tail surface which have the same dihedral relationship.

This dihedral arrangement is very old, far ante-dating actual flight by the Wright brothers. Practically every observer in the early art attempted to imitate the birds who have stability in flight partly by the dihedral position of the wings and the dihedral relation of the tail with both wings. They all overlooked the fact that the bird has capacity for instantly giving more or less incidence to either wing and more or less incidence to the tail feathers.

It being very difficult with an airplane to move the entire wings to give them more or less incidence, distorting a portion of them was provided by later inventors for the same purpose. This was also true of the tail assembly, the movements of the elevator corresponding to the movements of the bird's tail. All this was old prior to respondent's invention and was thoroughly understood in the art. Penaud and Gauchot in 1876 produced a machine (Binder 3-4) in their French patent No. 111,574 (Finding 15, Rec. p. 26) illustrating a construction which was almost identical in dihedral angles to the modern use of dihedrals.

No practical commercial airplane has ever been made wherein the dihedral arrangements introduced a sufficient stabilizing action to make the plane self-flying. The use of these angles being thoroughly well understood by aeronautical engineers, they are employed in many planes to produce a slight tendency to stabilize the plane. When an engineer wants a very stable plane he may use two or three degrees

of dihedral. Such, for instance, would be transport planes, where high maneuverability is not of any importance. If the engineer wishes a highly maneuverable plane he uses either zero dihedrals or very slight dihedrals.

The Curtiss JN-4 complained of in this case was an airplane in which it was desired to have high maneuverability, so it was given a very slight dihedral arrangement.

At best, the dihedral angles used are low. They give a slight tendency of the plane to right itself under normal conditions. They correspond to the tendency given to the steering wheel in modern motor cars to move back to a straight wheel position after being turned by the driver. It would be easy to make this tendency in a motor car very strong. The reason it is not done is because it would be highly dangerous since it would fight the driver's manual control of the car, his ability to make quick turns and avoid accidents, his ability to drive the car in rough roads, etc.

So also is the dihedral angle in airplanes. The self-righting tendency in an airplane caused by fixed dihedrals or sweepback constantly tends to align the plane with all gusts in ways that are quite unsafe for the plane. Even with a considerable amount of dihedral angle, the plane is too sluggish in its struggle back to normal to make it safe. What the airplane requires is the intelligence of the pilot acting through the powerful joy-stick controls to meet every emergency in lack of balance. When a plane is meeting up currents and down currents, gusts and turbulence from every direction, no *fixed* devices have ever made it safe.

Respondent's Invention Has Nothing to Do with the Presence or Absence of Inherent Stability. The use of inherent stability to the slight degree possible was well known at the time of respondent's invention. He was not trying to improve or to eliminate it or increase it. Respondent was trying to improve the manual control of the inclination or balance of the airplane. There is nothing in the patent in suit which fortifies the absurd contention of the petitioner. The patent in suit to any casual reader, let alone one skilled in the art, indicates that it was the control of the attitude

or inclination of the airplane for any purpose which the pilot required, that respondent had in mind.

The same is true with regard to the file wrapper. No distinction was made in the Patent Office or by the applicant between airplanes having fixed stabilizing means and those which omitted it. The art cited by the Patent Office made no distinction nor did the Patent Office itself in its actions.

From the petitioner's contention one might expect to find in the patent that the respondent desired to do away with the necessity of inherent stabilizing means and proposed to substitute therefor manual stabilizing. The patent does not even mention the character of the airplanes shown; whether they have any inherent stability or not.

From the foregoing it will be seen that this defense is conjured from thin air by the petitioner, and that the courts in the *Chance Vought* case were misled into a plain error.

Even the Court of Appeals Was Entirely Inconsistent in Upholding This Defense. In the quotation from the Court of Appeals decision (66 Fed. [2d] 479, second column), referred to in petitioner's brief on pages 93 and 94, after stating that "the patent has continuous hand lever manipulation for producing stability at all times," the Court makes this significant statement:

> "Appellee has automatic stability at all times, occasionally using the controls for *accentuating the automatic stability characteristics.*" (Italics ours.)

What does the phrase "accentuating the automatic stability characteristics" mean? It cannot mean other than that the controls are used to stabilize the machine when the automatic stability characteristics are either too slow or fail to work. This is a constant occurrence in the operation of modern planes having a feasible amount of inherent stability. Within 2,000 feet of the ground in turbulent air it is the rule and not the exception that the "automatic stability characteristics" do not work or do not work fast enough to avoid complete unbalancing of the plane. If he would save his life, the pilot must use the controls to stabilize or balance the machine or restore its equilibrium.

In Finding XI (R. p. 15) the Court of Claims has shown the facts with regard to inherent stability. *It is no longer an open question* in this case that in the case of planes having so-called inherent stability their banking and elevational controls (ailerons and elevator)

> "have a superimposed stabilizing tendency upon the plane and are used by the pilot for this purpose; that is to say, if the attitude of a plane in normal flight is disturbed by a gust of wind, the pilot may manipulate these controls and cause them to function in such manner as to stabilize or return the plane as soon as possible to a normal flight attitude, thus superimposing upon whatever inherent stability the plane has, an added stabilizing or equilibrium effect. The banking and elevational controls function respectively as lateral and longitudinal equilibrium controls, sometimes to assist and at other times to oppose whatever inherent stability or equilibrium has been built into the airplane."

Infringement Is Clear, Irrespective of the Interpretation of the Claims. If the claims are interpreted to cover the use of the joy-stick mechanism for all control purposes, as they should be, then all question of whether the organs are used for stabilizing or for maneuvering disappears.

But even if they are interpreted in the more limited sense of stabilizing or balancing the machine, the Court of Claims' findings hold that the petitioner's machines, *entirely irrespective of the inherent stability feature,* constantly use the combination in its entirety for stabilizing or balancing purposes.

There Is No Such Thing as Destabilizing a Plane Under Control. The petitioner says that in the government planes the use of the joy-stick mechanism is for the purpose of *destabilizing* the plane or *overcoming* its inherent stability. This is not possible while the plane remains under control. No plane is destabilized for maneuvers. What takes place in a maneuver, such as descending, banking, etc., is that the airplane by reason of the change in some air-foil surface,

such as the elevator, ailerons, steering rudder, etc., is stabilized in a *new attitude*. Thus in the ordinary maneuver of banking a turn, the moment the steering rudder is operated to make the turn, with a proper motion of the aileron to cause the machine to bank, the plane begins to assume a new attitude in which it is just as well balanced as though it were proceeding in level flight. As it continues the banking turn it progressively takes up new attitudes until the plane has reached its full bank; it continues to be stabilized during these new changes in attitude.

Were it not for these undoubted facts airplanes would go into spins every time they left a level flying condition. It is the ability of the pilot to progressively stabilize his machine in all attitudes which permits maneuvering at all.

At the same time that the maneuver is taking place the ailerons or the elevator or both are stabilizing the plane. Further than this, if one assumes a maneuver such as a curve wherein the plane has been banked and is held in such bank in stable condition, the plane is not immune from unbalancing forces while it maintains this attitude. It is just as much subjected to gusts, air currents, pockets, etc., as when it is flying level. Indeed, it is more subject to some air disturbances in banking or other maneuvers than it is when flying level. This is for the reason that a larger surface of the airplane wings, fuselage and fixed fins is exposed to the air disturbances under the maneuvering attitudes. Applying this to the simple banking maneuver, for instance, it will be seen that after a pilot has tilted his machine upon its side sufficiently to execute the maneuver, he must constantly be on the lookout for unbalancing forces. Anywhere near the ground these forces are sure to come and the pilot must use the ailerons and elevator to rebalance or stabilize the plane in its tilted attitude.

These facts are so obvious that it is remarkable that the courts in the *Chance Vought* case accepted the extraordinary theory that the Chance Vought planes used the controls to destabilize the plane. The lack of conviction, however, of the Court of Appeals on this point is shown by the quotation

already made from the Court of Appeals decision, to the effect that the ailerons and elevator were occasionally used "for accentuating the automatic stability characteristics" (Petitioner's Brief, p. 93).

Other Contentions of Petitioner on the Question of Infringement. In pursuance of petitioner's endeavor to evade infringement it indulges in a number of pages of loose argument, most of which finds its basis in the Court of Appeals decision. Many are based upon the two falsities we have just examined, namely, first, that the joy-stick control is not used on petitioner's planes because they are so stable that they do not require any control of equilibrium, and second, the real use for the joy-stick in petitioner's planes is to destabilize or destroy or overcome equilibrium.

Some of the remaining contentions of petitioner under this heading are plain out and out word juggling not designed to enlighten the Court, but to mislead it. We will refer to a few of them.

On page 89 of petitioner's brief is the statement "these controls are used by the pilot 'sometimes to assist and at other times to oppose' the inherent stability of the plane." The quotation is from R. p. 16, but it is entirely misleading. It is intended to clearly infer that the controls are used for *maneuvering* purposes, sometimes to assist them and other times to oppose them. Finding XI states that the manual controls have a "superimposed *stabilizing* tendency upon the plane and are used by the pilot for this purpose." The Finding further says that the pilot may use these controls "to *stabilize* or return the plane as soon as possible to a normal flight attitude." The beginning of Finding XI states: "An airplane may be constructed with a certain amount of transverse and lateral stability inherent in its structure." Further, that a *stabilizing* tendency is imparted to the plane by the inherent stability features. (All italics ours.)

Substantially the same misstatement is made at the top of page 91 of petitioner's brief, where a fancied resemblance between Finding XI and the Court of Appeals decision is referred to. If the Court of Appeals decision as quoted

means the same as Finding XI, then the Court of Appeals held squarely that the Chance Vought planes had the joy-stick mechanism for stabilizing and producing equilibrium in the plane for Finding XI means just that.

In the second paragraph of page 91 petitioner states that in its infringing planes the steering rudder and elevator are entirely independent; that there is no interconnection or interrelation or cross-response except of a minor character between the vertical and horizontal rudders. Following this is a lengthy description of respondent's construction in which it is stated that any movement imparted to the elevator necessarily changes the position and attitude of the steering rudder and *vice versa*.

The petitioner does not inform this Court that it has been clearly held as a *fact* by the lower Court that any cross-responses in respondent's ring-tail embodiment do *not* impair the operativeness of either lever and that each lever performs its function regardless of the position of the other lever (Finding XIV, R. p. 19). That in respondent's ring-tail structure (Finding XVII, R. p. 21) "The steering and stabilizing levers were mechanically separate and independent and each lever performed its own function regardless of the manipulation of the other lever." These findings entirely negative petitioner's statement.

On page 92 petitioner makes the statement that respondent's steering and pitching controls are "interdependently connected." The aforesaid Finding holds to the contrary.

On the same page petitioner makes the statement that in the tandem wing embodiment the control of the rear wing is by the interdependent horizontal sticks of respondent's 1906 patent. This statement as appears from the quotation (pp. 92, 93) was lifted from the Court of Appeals decision. There is not the faintest justification either in the specification or the drawing of the patent in suit for this statement.

On page 93 the petitioner quotes from the Court of Appeals decision and states: "We think the Findings here establish the same facts." The Findings here establish nothing of the sort.

On page 94 petitioner quotes as a difference between the infringing planes and the patent in suit that the infringing planes are biplanes and the patent in suit relates to a monoplane; it also says that it was not until just before the grant of the patent that the title of the patent was changed from "system of monoplan aeroplane." These statements are entirely disingenuous since the *claims* in suit from the very beginning were not limited to monoplanes.

At the top of page 95 is a particularly offensive misstatement and one that the petitioner should not be proud of. It is as follows:

> "The grant of the patent in suit over the prior Wright patent was secured only by the respondent's representation to the Patent Office that there was an important distinction 'between applicant's *monoplane* and the Wright *biplane*'."

This is crass error. The remark quoted from the file wrapper was made with regard to claims which were not directed to joy-stick combination at all (File Wrapper, p. 25, for claims; p. 35 for respondent's statement).

Not satisfied with this misstatement it is repeated in the next paragraph with even more emphasis.

At the bottom of page 95 petitioner says that the claims do not find verbal response in the infringing planes much less substance. In support of this it refers to the fact that claim 2 calls for distortable wings, whereas the infringing machines have ailerons. At no time in the history of this case has the strict equivalency of ailerons and warping wings been disputed and at no time, so far as we can recall, has it been disputed that wings with ailerons are distortable wings (see Finding XXII, R. p. 24).

The balance of the argument on page 96 is merely to the effect that the lower Court is wrong when it holds that the joy-stick mechanism is used in the infringing machines for equilibrium or stabilizing purposes as found in Finding XXI, R. p. 22, and Finding XXII, R. p. 24. Also that the lower Court was wrong when it held that pitch and steering

are separately controlled in the patented structure (Findings XIV to XVII, Rec. pp. 19-21).

The remaining pages of petitioner's brief are dealt with elsewhere.

The Use of a Patented Device for Any Cognate Purpose Is an Infringement.

It is a principle of patent law reiterated many times that a patentee is entitled to control any use to which his patented device may be put. If there is any exception to this rule it would have to be where the use is exceedingly remote.

If it were true, as petitioner says, that petitioner uses the joy-stick mechanism solely to destabilize its planes, its use for any stabilizing purpose being prohibited by the inherent stability of its planes, and if it were true that the claims in suit are strictly limited to a stabilizing use of the ailerons and elevator, petitioner's planes would still infringe the patent in suit, and particularly claim 2 thereof.

Claim 2 does not use the term "means for producing lateral stability" or "means for producing longitudinal stability." It names these organs by name, viz., distortable wings and a rudder. Petitioner's machines have distortable wings beyond peradventure. The wings are distorted in the old way by ailerons. Such machines also have a rudder (the elevator). In claim 2, even under petitioner's most drastic misinterpretation, the phrase "for maintaining transverse stability" *merely describes one use* of the distortable wings. The phrase "for maintaining longitudinal stability" merely describes one use of the elevator. The petitioner's planes have a lever for controlling the wings of the plane and the rudder as called for by the claim. They have a steering rudder and a separate lever for controlling the steering rudder.

That is the patented combination of claim 2. Under the principle above referred to the respondent is entitled to cover this combination of distortable wings, horizontal rudder, a common lever for both, a steering rudder and a separate steering lever for any function they perform.

Petitioner claims (although it is not the fact) that it has a plane so stable that it flies itself, and that it uses the distortable wings, elevator and joy-stick wholly and entirely to destabilize the plane for maneuvers. While this is absurd, let us assume that it is true.

The net result is that petitioner has taken the joy-stick mechanism bodily and placed it in an airplane so that it performs precisely the same aerodynamic functions as it does in respondent's planes. These functions are that the distortable wings turn the plane in either direction around the longitudinal axis of the plane; that the elevator turns the plane around its horizontal transverse axis.

Petitioner has never denied, and cannot deny, that the movements and responses of its joy-sticks are exactly the same as in the patent in suit and as claimed in claim 8.

It is obvious from this statement, which cannot be disputed, that the claimed mechanism is used by petitioner merely for another purpose which is so exceedingly close to maintaining stability that if any one of petitioner's planes were merely to have its wings and tail surface straightened, to remove *the inherent* stabilizing tendency, the joy-stick mechanism with which it is provided would continue to function in its same old way and perfectly operate the plane.

Under the principles above referred to this is infringement pure and simple.

Much the same reasoning applies to the remaining claims. If "means for producing * * * stability" in combination with the joy-stick are bodily lifted from the patent and placed upon one of petitioner's planes where they operate in an identical fashion, and petitioner finds that they are indispensable for performing some other similar result, then infringement is present.

The situation is capable of being stated in another way, viz.:

The petitioner's planes have a complete joy-stick structure with the complete joy-stick operation as the Court of Claims says "word for word and element by element" (Rec. p. 73). It is not disputed that this structure is present on the

petitioner's planes ready at any instant to maintain or produce stability or equilibrium. If the petitioner, as it says it does, chooses to introduce inherent stability characteristics to the nth degree, if that were possible, the joy-stick structure is present, capable of performing according to the most limited interpretation given to the claims. This is infringement.

Errors in the Decision of the Court of Appeals in the Chance Vought Case.

Doubtless, as the Court of Claims says—since the Court of Appeals did not have before it the full and complete record which was before the Court of Claims and upon which its findings were made—its errors may be largely ascribed to lack of evidence. Some of them, we submit, however, are plainly apparent from the evidence which the Court of Appeals had before it.

We will refer to both classes of error below.

1. In the second paragraph on page 476 [66 Fed. (2d)] the Court states that, "In the basic French patent [the 1906 patent] * * * the stabilization producing lever (called the joy-stick by appellant)" causes the plane to go up when it is moved up, down when it is moved down, roll to the left when the stick is moved to the left, and roll to the right when the stick is moved to the right.

It is perfectly apparent to anyone who considers the 1906 patent that it would not cause all of these movements unless the left-hand lever is held by the pilot and its tendency to move resisted by the pilot. It is essentially a two-handed control (Finding IV, Rec. p. 8).

2. In the third paragraph on page 476 the Court says that the patent in suit discloses three forms of airplane, two of which have never been built—the ring-tail and tandem-wing monoplane. The Court of Claims had before it evidence that a ring-tail structure was built and tested in July, 1931, and that Court so finds (Finding XIII, Rec. p. 18).

3. Toward the middle of the paragraph the Court of Appeals says that in Fig. 6 of the patent in suit the right-hand lever is the same in function and operation as the right-hand lever of the 1906 patent. This is, of course, wrong, since the patent in suit does not require the use of two hands (Finding IV, pp. 7-8) as does the 1906 patent control.

Further, it is erroneous for the reason that the 1906 lever cannot move forward or backward.

4. At the end of this paragraph the Court says that the action of the steering rudder and horizontal rudder are interdependent. This is proven to be wrong in the case at bar (see Findings XIV to XVII, Rec. pp. 19-21).

5. On page 477, second paragraph, the Court of Appeals erroneously states that the bird-tail steers left or right in response to the corresponding and sometimes in response to the opposite movements of the steering lever, depending upon the position of the joy-stick. This is entirely in error, since in the bird-tail structure the bird-tail has always a positive incidence, since it is designed to bear a part of the load of the plane. It causes the airplane to nose up or nose down by presenting less or greater incidence to the air. There is nothing in the patent indicating that this bird-tail passes a neutral point and swings to the upper side of the fuselage (Finding XIV, Rec. p. 19).

6. In the same paragraph the Court of Appeals says, "the tandem wing is controlled for pitch, roll, and steering by the two interdependent horizontal sticks constituting the 'inherently defective' system of the 1906 French patent."

It is easily ascertained from the specification that this is plain error (p. 1, lines 53 *et seq.*, and p. 3, lines 78-82 of the patent in suit).

7. On page 477 the Court of Appeals states that in the operation of the ring-tail and bird-tail embodiments the pitch and yaw movements cannot be controlled by either lever alone. In the case at bar the Court of Claims has found directly to the contrary (Findings XIV to XVII, Rec. pp. 19-21).

8. At the bottom of the first column of page 477 the Court of Appeals states that the structure of the 1906 French patent "was operative, and could be applied to a modern plane for control." It never has been so applied or proven operative (Finding IV, Rec. p. 8).

9. At the middle of page 477 the Court of Appeals states that the appellant makes claim that there is an instinctive use by the operator of the control levers, and follows this with the statement: "But the patent makes no claim that this operation is preferred to the opposite one * * *." Of course, the Court of Appeals was in error as to this, as claims 7 and 8 distinctly claim a combination having the mode of operation from which the instinctive use flows.

10. Near the middle of this paragraph the Court states that this virtue is opposed by two out of the three embodiments illustrated and described. In this the Court makes an obvious error, since—even if Fig. 7ª be regarded as a separate embodiment (which it, obviously, is not), being described as a view of the bird-tail construction—there would be at least four separate modifications in the patent in suit—namely, (1) ring-tail, (2) bird-tail of Fig. 10, (3) bird-tail of Fig. 7ª, and (4) tandem monoplane. The specification clearly describes the ring-tail and bird-tail of Fig. 10 and their mode of operation, and states with regard to the tandem monoplane, as above quoted, that it may be operated as the bird-tail. There are, hence, four modifications and only one of these—namely, Fig. 7ª—shows opposite responses fore and aft—and this is clearly a draftsman's error.

11. In the first paragraph of page 478 the Court of Appeals refers to the Laroze patent, and states that it embodies the principle of the joy-stick control and that this control can be handled by one hand, much as an automobile steering wheel acts in response to a hand direction. This error is obvious to a mechanic skilled in the art who reads the Laroze patent. It is impossible to obtain a lateral control in Laroze with one hand, since to obtain it requires that the wheel be twisted around a vertical axis like a handle-bar, and, unless

two hands are used, a longitudinal pitch is inevitably set up (Finding XXVIII, Rec. p. 28).

12. In the next to the last paragraph on page 478 the Court of Appeals refers to the Ferber publications, and states the construction of their control. The Court also states that the Ferber booklets were prior publications and constituted prior art. It is obvious to anybody examining these booklets that no control mechanism is shown or described therein. This is a clear error of fact (Finding XL, Rec. p. 33).

13. If the Court of Appeals intended to combine with the Ferber booklets the testimony of the French witnesses given twenty-five years later as to a private use by Ferber in France, it committed a clear error of law, which the Court of Claims takes pains to point out (Rec. pp. 67-69), with a wealth of authorities.

14. In the first paragraph of the second column of page 478 the Court of Appeals gives its views on validity. The first of its conclusions was that there was no novelty in twisting the lever of the 1906 French patent from a horizontal to a vertical position and substituting a lateral pivoting movement of the upstanding lever for a rotary movement, as in Laroze. The Court apparently did not pay any attention to the extremely important results which followed the joy-stick invention. The Court's conclusion on this point was a generality. It did not state how this substitution was to be made; what changes in mechanism would have to be made to produce it. It did not state that both Laroze and the 1906 structure are two-handed structures. It did not state that in the patent in suit the very important result of making a plane follow the tilt of the stick in all directions was attained, and it did not state that substituting a vertical lever (notwithstanding the difficulty of doing it) in the 1906 patent would still make a two-handed structure.

15. The Court's next statement is that it would not involve invention to grasp the levers of Ferber above the pivot instead of below the pivot. This is a perpetuation of the error that Ferber is available at all. It is not (Finding XL, Rec. p. 33).

16. The Court's next statement is that there is no novelty in the use of a lever to operate two or three controls, or in determining as an engineering problem the choice as to which of the three controls should be operated by a single lever. This presupposes that the ideal control, when found, would be a lever control; or that the ideal control would operate two controlling organs. No one could tell these things. The ideal control might have been a slide, or a wheel, or a handlebar, or any other operatable mechanism; it might have involved the combination of the steering and elevator control, or the steering and lateral control or separate controls for all three. There was no suggestion in the prior art of the important feature of the plane's being self-indexing, so that it followed the tilt of the stick; there was no suggestion in the art of availing the pilot's instinctive balancing movements.

17. The third paragraph of page 478 limits the patent to the structure disclosed employing the bird-tail or ring-tail unit with a restricted range of equivalents. This was the result of a misunderstanding of the novelty and importance of the invention in suit.

18. On pages 478-479 the Court discusses the alleged estoppel by the erasure of claims 12 and 13. We will not repeat what we have said on pages 67 *et seq.* with regard to the question of estoppel.

19. In the third paragraph of page 479 the Court of Appeals states that the "Corsair" machine is designed and built to be inherently and automatically stable; that it may be flown with hands off the controls for long distances at a time; that the controls are usually operated when it is desired to overcome the automatic stability in order to execute some maneuver such as taking off, landing, or making a bank. We have already discussed this, and would only say that the Court failed to comprehend the ordinary operation of an airplane.

20. The Court next says, in distinguishing the "Corsair" from the patent, that the patent provides a monoplane with distortable wings, while the "Corsair" is a biplane with ailerons. As none of the claims in suit is limited to a monoplane, and as it is freely admitted that ailerons are a form of distortable wings, these distinctions disappear.

The Court then refers to the bird-tail with wing-warping to produce lateral stability, as distinguished from the inherent stability of the "Corsair." This begs the question, since the elevator and ailerons of the "Corsair" equally produce stability in the sense in which the Court uses them.

21. The Court next refers to the fact that the patent has a single lever, while the "Corsair" has dual levers; that is, the Court thinks it a distinguishing characteristic that the "Corsair" was a training plane, with *two joy-sticks—one for the student and the other for the pilot.*

22. The Court then states, at the top of page 479, second column, that the patent has levers to produce stability; the "Corsair" has handles to produce instability by destabilizing the machine for an evolution. We have discussed the impossibility of destabilizing, or producing instability for an evolution, on pages 82-84.

23. The Court then refers to the alleged fact that the patent has continuous hand-lever manipulation for producing stability at all times; that the "Corsair" has automatic stability at all times, occasionally using the control for accentuating the automatic stability characteristics. We have previously discussed this point. Accentuating automatic stability characteristics is nothing less than stabilizing in its most limited sense.

24. In the first paragraph of page 479, with regard to blind flying, the Court of Appeals continues to make the error that the patent in suit is limited to maintaining equilibrium solely by the manipulation of the control levers; whereas, as a matter of fact, the patent in suit says nothing about the presence or absence of automatic stability. The Court says nothing about taking off and landing, or condi-

tions of turbulence of the air. The Court of Claims (Rec. p. 73), on the record before it, asked the pertinent question: "Why is it necessary to spend so much time instructing aeronautical pilots in the art of blind flying, as has been brought out by defendant's experts," if an airplane can be designed to fly itself. The record in this case before the Court of Claims establishes as a fact that the ailerons, elevator and joy-stick in the infringing machines operate to control the longitudinal and transverse equilibriums (Findings XXI and XXII, Rec. pp. 22-24); and by Finding XI (Rec. pp. 15-16) establishes as a fact that in airplanes having inherent transverse and lateral stability, the joy-stick control of equilibrium is still present.

30. The Court of Appeals next discusses the claims in suit and, on the same theory—that modern airplanes fly themselves—finds no infringement. The findings on the record in this case are directly to the contrary, as just stated. The holdings of the Court of Appeals on this point were the result of its being led completely astray as to the ability of the modern airplane to balance itself without any aid from the ailerons, elevator and joy-stick. In the case at bar, evidence was presented to show the falsity of this idea, and the Court of Claims has in effect so found in Findings XI (Rec. pp. 15-16), XXI and XXII (Rec. pp. 22-25).

The 1906 French Patent Is Neither Prior Art Nor the Equivalent Thereof.

The Court of Claims held that the joy-stick mechanism was patentable over the entire prior art, *including the 1906 French patent*. The Court of Appeals held that the 1906 structure was prior art to such an extent that it could be combined with the Laroze patent or other true prior art to constitute an anticipation of the patent in suit.

The facts are as follows:

The 1906 patent was applied for in France on December 19, 1906. The second and third French patents upon which the patent in suit is based were applied for in France in

January, 1907 (19th and 22nd). All of the applications were co-pending.

The patent in suit was applied for January 16, 1908, or within the year allowed by Section 4887, R. S., and the International Convention. Under these the application for the patent in suit dates back *for all purposes* to January 19th and 22nd, 1907. The 1906 French patent was issued and published February 18, 1907, or about one month later than the effective date of the application for the patent in suit. Consequently, the French 1906 *patent* cannot be actual prior art. It was neither prior nor art, for it was later than the effective application date here.

The 1906 structure may be treated as an invention in the same sense as it would be if it were true prior art patented or published ten or twenty years before the invention in suit. In this case it would be proper to combine it with any other true prior art for the purpose of fabricating whatever anticipation the facts permitted.

Or it may be treated, as Section 4887, R. S., appears to provide, as a measure to show what cannot be patented here. So interpreted its only pertinence in the case at bar is for comparison with the joy-stick invention to ascertain whether the latter is the same invention as that shown by the 1906 structure or not. If the joy-stick invention upon such comparison proves to be the same structure in substance, it cannot be patented here. If it proves to be a substantially different structure, it can be patented here.

Respondent's contention is that the latter interpretation is correct. Section 4887, R. S., does not deal with anticipation at all. It deals with the forfeiture or dedication of rights which were possessed by the applicant. Section 4886 deals with the conditions necessary to secure a valid patent by anyone, whether a citizen or an alien. Section 4887 has has to do with a special condition of forfeiture. If that condition of forfeiture does not exist, that part of Section 4887 which deals with it becomes inoperative.

Applying these principles to the present case it results that if, upon comparison of the invention of the patent in

suit with the 1906 structure, the former is found to be a different invention, then the 1906 structure has no further pertinence in this case.

To put the matter in another way: Section 4887 does not deal with the question of whether or not the patent in suit shows invention over the 1906 structure plus any conceivable structure which might be built up thereon by recourse to the prior art. Once it is determined that the joy-stick structure is not the same invention as the 1906 structure, the question of anticipation should be ascertained under the provisions of Section 4886.

Any comparison of the 1906 structure with the structure of the patent in suit shows that the 1906 structure is a two-handed control of equilibrium, while the joy-stick structure is a one-handed control. The 1906 structure is not self-indexing and does not follow the tilt of the plane; the joy-stick structure is self-indexing and follows the tilt of the plane. The 1906 structure does not operate in accordance with the balancing instinct of the pilot as to its longitudinal control: the joystick structure operates in accordance with this principle as to all types of control. There seems no question but that, when the 1906 structure alone is considered, the joy-stick structure is not the same invention.

The 1906 structure was not patented here and of course the United States public has the right to use it. The respondent could not patent it here. But the patent in suit does not pretend to cover the 1906 structure. No claim in the patent in suit includes that structure.

The contention of respondent is that this dedication or abandonment of the 1906 structure taking place ten months after the effective date of the application here of the patent in suit constitutes no warrant for using this 1906 structure as a part of the prior art. It was not in the public domain until after the effective date of the application for the patent in suit. It was not the work of another prior to the invention of the patent in suit. If the 1906 structure had, in fact, been the work of another it could have no effect whatever upon the validity of the patent in suit.

The Courts in many cases prior to the present form of Section 4887 were called upon to interpret substantially the first paragraph of this section. They universally held that this paragraph did not apply to any invention which was not the *same invention* as that applied for abroad.

The test invariably set up was as follows: Is the invention of the patent in suit the same invention as that previously patented abroad? If it is the same invention, the patent in suit is limited to expire with the foreign patent. If it is not the same invention, the patent in suit is not so limited.

Among the many cases decided by the Courts on this point, see the following:

Leeds & Catlin v. *Victor*, 144 O. G. 1089 (213 U. S. 301);
Hennebique v. *Myers*, 172 Fed. 869;
Victor v. *Hoschke*, 188 Fed. 326;
Acme v. *Commercial*, 192 Fed. 321; and
Fireball v. *Commercial*, 239 U. S. 156.

Under the present Act of 1897, see

General Electric Co. v. *Alexander*, 277 Fed. 290, aff'd 280 Fed. 852 (C. C. A. 2nd).

It is clear from these decisions that the first paragraph of Section 4887 deals only with the *same invention*.

The comparisons in these cases made by the Courts were essentially to determine the presence or lack of identity. They had nothing to do with the questions of validity or anticipation. Such comparisons were similar to the examination of two deeds, to ascertain whether or not they related to the same piece of realty, with no intention of determining whether either was valid.

The loss of the right to patent the 1906 structure in the United States, as a matter of equity, is a proper penalty for respondent's failure to apply for a patent here on that structure. The law does not favor forfeitures, and certainly not beyond those which are strictly necessary to conform to

the wording of a statute. If, in addition to the loss of rights in the 1906 structure, this structure be made an element in an attempt to destroy respondent's rights under the invention of the patent in suit, this would be carrying the penalty beyond any needed or appropriate purpose.

At the time of the filing of the second French application, respondent stood in the position of being sure of a patent in the United States on the joy-stick mechanism provided he filed within the year from the date of such second application. He also stood in the position of being sure that, if he did not file an application for the 1906 structure within a year from the date of that application, that structure would be abandoned. He conformed to the statute and to the International Convention as to the joy-stick mechanism, but he did not forfeit the 1906 structure here until ten months later than the effective date of the joy-stick application here in the United States. Certainly, respondent had no intent to abandon more than the 1906 structure.

Without doubt the answer to the problem propounded is a matter of judicial interpretation. We submit that the interpretation should be such as to restrict the forfeiture to the structure forfeited, and should not be extended to place the forfeited structure in a position in all respects analogous to prior art.

If this interpretation prevails, any attempt to combine the 1906 structure with true prior art is excluded.

Conclusion.

Questions of validity, scope and infringement have long been held to be questions of fact. The findings of the Court of Claims, we submit, establish that the patent is valid and infringed.

The findings with regard to validity—while they do not specifically use the words, "the patent is valid"—are, we submit, inconsistent with any other conclusion. All of the defense patents which rightfully should be considered as part of the aviation art, and including respondent's 1906 French patent, are analyzed and found to lack very essential

features possessed by the patent in suit. In none of them is there a single control of equilibrium in any form—let alone a control by a hand lever, and especially by a vertical, universally-mounted hand lever. In none of them is there to be found the simple, direct control movements of the joy-stick which obviate any calculation on the part of the pilot as to the degree of elevator and aileron movement necessary to correct compound disturbances in attitude or to produce a compound tilt of the plane in maneuvering. In none of them is this simple, direct movement so combined with the airplane itself that the attitude of the airplane forms an unfailing index or indicator telling the pilot instantly in what direction he should move the control lever to effect any suitable correction or to make any conceivable maneuver. In none of them is the movement of the control lever or levers correlated with the instinctive balancing movements of the pilot.

It is obvious that these findings dispose of the question of invention as a fact.

One could not combine any two or more of the old controls to produce the joy-stick unless he had, first, the complete conception of the joy-stick combination.

The alleged anticipations of the type of Wadsworth and others are in alien arts. As to most, if not all, of them, the Court holds as a fact that they contain no suggestion or description of any use in aviation.

As to all of them, their mere existence would not in any way help the solution of the equilibrium control problem of aviation in the manner so successfully accomplished by the joy-stick mechanism.

There is no conflict between the Court of Claims and the Court of Appeals as to the fact that similar patents lie outside of the permissible prior art.

On the question of infringement, we submit that this is foreclosed since there are particular findings of fact (Findings XXI and XXII, Rec. pp. 22-25) which completely negative the claim of petition that the joy-stick mechanism in the infringing planes is not used for equilibrium or stabilizing purposes. If this mechanism in the infringing planes is used

for such purposes, the claim of non-infringement becomes completely untenable, even though the claims be strictly limited to the use of the joy-stick mechanism for stabilizing purposes. In addition, we have shown, we submit, that the claims are fairly entitled by their terminology, by the prior art, and by the patent itself, to an interpretation by means of which the patent in suit covers the use of ailerons, elevator and joy-stick for maneuvering as well as stabilizing. This is true since, no matter for what purpose these parts are used, they always perform precisely the same function—namely, that of turning the machine around its major axes.

The special defenses, such as the Ferber defense and the Bleriot defense, are shown to be baseless by the findings.

The first point of law involved in the petition—namely, that of intervening rights—is shown to be baseless by the fact that claim 2 existed in the case continuously since February 1, 1909, and, from that date on, to the issuance of the patent. Claims of the scope of claims 12 and 13 were continuously in the case down to the date of issue with the exception of a period of thirteen months—thus not conflicting with the rule in *Chapman* v. *Wintroath* (*supra*) and *Westinghouse* v. *Jeffrey-DeWitt* (*supra*), etc.

The second point of law—namely, that, because of the erasure of claims 12 and 13, the claims in suit cannot be interpreted broadly enough to cover petitioner's structures—is shown to be baseless: first, because the claims in suit are of the same scope as claims 12 and 13, and, second, for the reason that petitioner's planes are found as facts to contain the invention in suit, even though the claims are strictly limited to stabilization, to which petitioner insists they are restricted.

The third point of law—namely, that Section 4923, R. S., should be interpreted to let in the Ferber public use—is shown to be baseless since the substance of Section 4923, R. S., has been a principle of United States patent law for a hundred years, and the section makes no distinction as to where the foreign use is or who the inventor is.

The opinion of the Court of Appeals—probably because of the different record before that court—is shown to have been based largely on an erroneous state of facts, and in some part upon an erroneous conception of the law.

The rule, which has been enunciated by this Court so many times that it requires no citation of decisions, is that if the question of invention is in doubt, this doubt will be resolved in favor of the patent if the patented structure has supplanted previous inventions, provided that this commercial success cannot be attributed to other reasons than sheer merit. We doubt if this Court has had many cases before it wherein the universal adoption of the invention was more attributable to the merit of the device than is the invention at bar. The United States was struggling along with the second Wright and Curtiss controls until the United States entered the war and its forces arrived in France. By that time France had adopted the joy-stick control for all planes, wherein the strength of the pilot, operating through the joy-stick, was sufficient for control without unduly tiring the pilot. From that time on, apparently, the United States completely adopted the joy-stick to the exclusion of all other controls for such airplanes. There was no advertising, no pushing, or high-pressure form of introduction. For a period of nearly twenty years succeeding the entry of the United States into the war, the joy-stick control has never been supplanted. Indeed, it would be difficult to imagine, even as a possibility, a more effective, simple, self-indexing, instinctive and altogether desirable method of manual control. There is nothing left to be desired.

During all of this time the United States has used the joy-stick control, it has used precisely that combination which constitutes the most complete embodiment of the respondent's invention—namely, that in which the plane follows the tilt of the stick and in which the responses are instinctive. General Foulois, at the time Assistant Chief of the Army Air Corps, testifying for the petitioner, says of the joy-stick control (Rec. p. 51):

> "* * * I would say that the control that we are using to-day, as compared to the controls that we have used in the past, is much less complicated, much easier to learn, much easier to handle, and easier to operate and control your airplane in connection with

all the other various pieces of equipment and instruments that you have to handle in the plane.

* * * * * *

"I would say that the present stick control is the most satisfactory control we have ever had from the standpoint of operating your airplane, and from the standpoint of minimum amount of attention which may be required to operate all the other various pieces of equipment that you have in a plane to take care of."

We submit that, if the question of invention of the patent in suit were in doubt, the success attained, as above referred to, should surely resolve the doubt in favor of the patent.

The point of law which we have discussed with relation to the exact status of the 1906 patent is one which need not be determined if the Court agrees with us as to the above conclusions. We believe, however, that respondent's failure to patent here the crude, two-handed 1906 structure should impose on him no severer penalty than the loss of the rights to that structure. Since the applications were co-pending, since the United States application on his second and third French patents was entitled to date anterior to the issuance of the 1906 French patent, and since the actual forfeiture was not until ten months later, we see no justice in treating this 1906 structure as though it were part of the prior art and thereby attempting to break down the patent in suit by combining it with other art.

The opinion of the Court of Claims and the authorities cited by it are believed in strict accordance with the facts and the law.

It is submitted that the decision of the Court of Claims should be affirmed as to the validity of all of the claims in suit and the infringement thereof by petitioner's planes.

New York, October 19, 1936.

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APPENDIX.

U. S. C., Title 28.

SECTION 288. *Certification to Supreme Court of questions of law; certiorari by Supreme Court to Court of Claims; no other review allowed.*

(a) In any case in the Court of Claims, including those begun under section 287 of this title, that court at any time may certify to the Supreme Court any definite and distinct questions of law concerning which instructions are desired for the proper disposition of the cause; and thereupon the Supreme Court may give appropriate instructions on the questions certified and transmit the same to the Court of Claims for its guidance in the further progress of the cause.

(b) In any case in the Court of Claims, including those begun under section 287, it shall be competent for the Supreme Court, upon the petition of either party, whether Government or claimant, to require, by certiorari, that the cause, including the findings of fact and the judgment or decree, but omitting the evidence, be certified to it for review and determination with the same power and authority, and with like effect, as if the cause had been brought there by appeal.

(c) All judgments and decrees of the Court of Claims shall be subject to review by the Supreme Court as provided in this section, and not otherwise. (Feb. 13, 1925, c. 229, § 3, 43 Stat. 939.)

SECTION 4886 (U. S. C., title 35, sec. 31). Any person who has invented or discovered any new and useful art, machine, manufacture, or composition of matter, or any new and useful improvements thereof, or who has invented or discovered and asexually reproduced any distinct and new variety of plant, other than a tuber-propagated plant, not known or used by others in this country, before his inven-

tion or discovery thereof, and not patented or described in any printed publication in this or any foreign country, before his invention or discovery thereof or more than two years prior to his application, and not in public use or on sale in this country for more than two years prior to his application, unless the same is proved to have been abandoned, may, upon payment of the fees required by law, and other due proceeding had, obtain a patent therefor.

SECTION 4887 (U. S. C., title 35, sec. 32). No person otherwise entitled thereto shall be debarred from receiving a patent for his invention or discovery, nor shall any patent be declared invalid by reason of its having been first patented or caused to be patented by the inventor or his legal representatives or assigns in a foreign country, unless the application for said foreign patent was filed more than twelve months, in cases within the provisions of section forty-eight hundred and eighty-six of the Revised Statutes, and six months in cases of designs, prior to the filing of the application in this country, in which case no patent shall be granted in this country.

An application for patent for an invention or discovery or for a design filed in this country by any person who has previously regularly filed an application for a patent for the same invention, discovery, or design in a foreign country which, by treaty, convention, or law, affords similar privilege to citizens of the United States shall have the same force and effect as the same application would have if filed in this country on the date on which the application for patent for the same invention, discovery, or design was first filed in such foreign country, provided the application in this country is filed within twelve months in cases within the provisions of section forty-eight hundred and eighty-six of the Revised Statutes, and within six months in cases of designs, from the earliest date on which any such foreign application was filed. But no patent shall be granted on an application for patent for an invention or discovery or a

design which had been patented or described in a printed publication in this or any foreign country more than two years before the date of the actual filing of the application in this country, or which had been in public use or on sale in this country for more than two years prior to such filing.

SECTION 4923 (U. S. C., title 35, sec. 72). Whenever it appears that a patentee, at the time of making his application for the patent, believed himself to be the original and first inventor or discoverer of the thing patented, the same shall not be held to be void on account of the invention or discovery, or any part thereof, having been known or used in a foreign country, before his invention or discovery thereof, if it had not been patented or described in a printed publication.